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Contractors and Engineers Monthly

Vol. 44, No. 6 JUNE, 1947 $3 a Year, 25 Cents a Copy

Covering the Field

• Safety on Road Jobs
On this page, a well-known construction man tells how his firm's safety program is set up and what it has achieved.

• Surveys by Radar
Use of this wartime "black magic" to track sounding craft through fog may revolutionize water surveys. See page 2.

• Bridge Construction
The 5-mile job featured on page 6 includes six trestle bridges on concrete-pile bents and a main river crossing.
Page 59 tells how a five-man crew, using truck-mixed concrete, finished a 12-foot-span structure in the allotted time.

• Highway Grading
Fast-traveling machines on long hauls move 750,000 yards for a 15-mile job covered in the article on page 11.

• Concrete Paving
A 2.11-mile job employed truck-mixed concrete and spade-type expansion joints. Page 18 recounts the story.
Finishing machines and a crushing plant speeded a 9.7-mile job. See page 41.

• County Road Work
Blading gravel windrows over its roads regularly is one secret of a county's low-cost maintenance (page 23).

• Canal Grading and Paving
Contractor-developed trimming and Guniting rigs set records on small lateral irrigation canals. Read page 27.

• Hints on Road Maintenance
An article on page 33 tells some of the methods two maintenance foremen have learned in their years of experience.

• Soils Studies
Subgrade soil practices of the 48 state highway departments and the District of Columbia are summarized on page 37.

• Road-Mix Project
Insidious drizzles played havoc with windrows of sand and asphalt road-mix for the surfacing job reported on page 46.

• Roadside Parks
A state has built five new wayside parks with picnic facilities on its scenic highways. Page 51 covers a typical one.

• Highway Costs
An analysis of why our highway costs are rising and what we and competition in the industry can do appears on page 53.

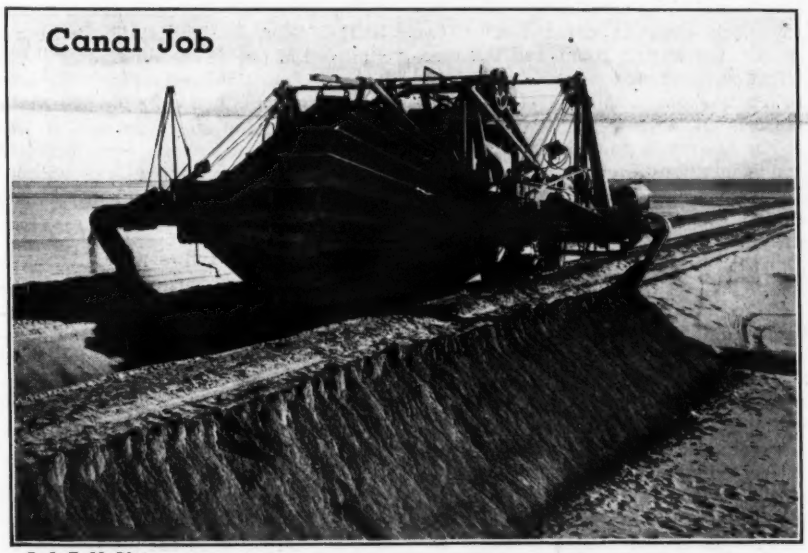
• Care of Equipment
Large shops at the site overhaul muck cars, sharpen drill bits, etc., for a big under-river tunnel project. See page 64.

• Hydroelectric Project
The building of two concrete dams, a power canal, and powerhouse is told in words (page 73) and pix (pages 44-45).

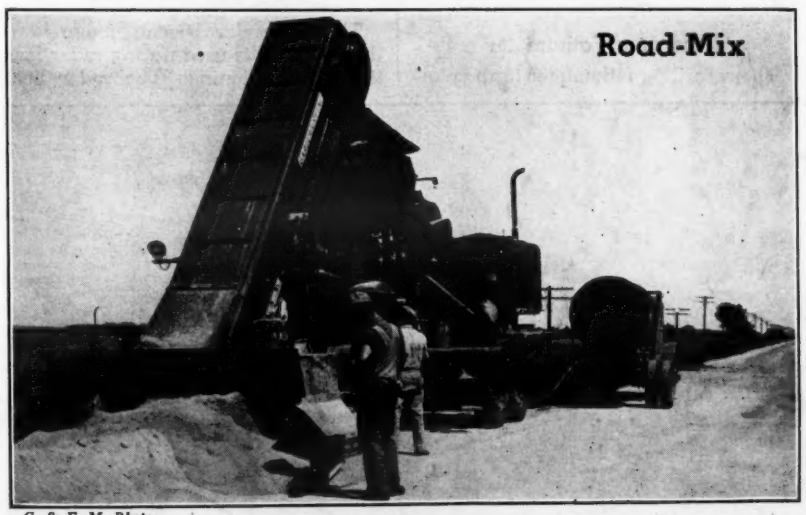
• Aerial Surveys for Roads
Page 85 tells how a state saves time and money by buying aerial surveys and training its road engineers to use them.

(You will find *"In This Issue"* on page 4)

C. & E. M. Photo
Two Rex 5-yard truck-mixers on Mack trucks discharge concrete via chutes onto the grade of a new 2.11-mile road to replace Route 22 in New York. The Jaeger spreader shown here will level the pour. The entire contract, held by Grandview Co. of Mount Vernon, N. Y., is described in an article on page 18.



C. & E. M. Photo
This odd-looking canal trimmer is named the Gimmick. Macco Corp., of Clearwater, Calif., built it for its recent Bureau of Reclamation contract on the Gila Irrigation Project near Yuma, Ariz. The job is reported on page 27 of this issue. With ground speeds of from 1¼ to 2½ fpm, the Gimmick opens up so much canal that special Guniting machines were built to keep pace.



C. & E. M. Photo
Hampered by rain, the Inland Construction Co. of Omaha road-mixed 11.9 miles of surfacing for an old Nebraska road. The story appears on page 46. This Model 848 heavy-duty Barber-Greene traveling plant picked up the windrow material and mixed it with RC-3 asphalt delivered from a tank truck.

Is Your Road Job Set Up for Safety?

Planning, Safety Clock, Pay-Envelope Reminders, Alertness of Supervisors Will Reduce Accidents

By RICHARD B. KOSS, Vice President, Koss Construction Co., Des Moines, Iowa

✦ EVERYONE will agree, I think, that safety in highway and airport construction is an essential part of the business of constructing these improvements. It is, however, all too easy to put off and let slide unless someone in management is willing to make a particular point of getting a safety program started.

We got our own safety program speeded up in 1946, a year when we used slightly more than 1,000 employees on our grading, concrete paving, asphalt paving, and bridge operations. We expect to have the program entirely under control during the 1947 season. I point this out because it does take time to get all of your employees thinking along safety lines, and there is a *definite routine* to set up in order to make the program effective.

Visual Reminders

We use several ways to remind supervisory employees, operators, and workmen employed on a project that safety is something the company practices—and that it insists on employee cooperation. For example, we have a safety clock on each project. On it is recorded the number of days that the project has run without involving a lost-time accident. The clock is moved forward daily in the event that there is no accident. But if there is one, then the clock has to return to zero and start over again. No one on the job likes to see the clock moved back, and we feel that this is one way of reminding men about the safety program.

In addition, we use two more visual reminders. Alongside the safety clock is a high metal flagpole on which flies the National Safety flag—the familiar green cross which we all recognize. And the men this year will receive their pay checks in envelopes which stress the safety theme, a very constant reminder of the safety program.

For its part, the company supplies modern, well maintained equipment which makes safety entirely possible. The plant and construction sites are kept clean and tidy. There is little opportunity to fall over loose boards, step on nails, etc. Good visibility is always maintained at the plant and on haul roads. Calcium chloride, road oils, or both are used when conditions warrant.

Foreman Supervision

It is more difficult, of course, to organize a safety program on a highway or airport job than on one being done in a restricted area. A highway job, for

(*Concluded on page* 83)

Radar Experiments May Radically Alter Coastal Survey Work

Wartime Detector Device Reaches Through Fog and Haze to Track Sounding Craft in Gulf Harbor

By RAYMOND P. DAY,
Western Editor

✦ RADAR—the black magic of World War II—may serve the construction industry. If results on experimental hydrographic work under the direction of D. W. Griffiths, District Engineer at the Galveston Office of the Corps of Engineers, are what they seem to be, radar may revolutionize water surveys.

The idea is simple enough. Instead of elaborate survey work and computations as they were handled in the past, why not bounce a radar impulse on the hull of the sounding boat when she measures a depth? Why not read her azimuth and range at a glance, instead of having to measure them with sextants? Why not, indeed! That was the thought which came to Lieut. Col. W. W. Vance one evening in late 1945.

Vance, then as now in charge of the Operations Division in the Galveston District, was thinking more in terms of sounding costs than futuristic engineering. Soundings were costing the District 43.4 cents apiece under the old methods, on which it seemed well-nigh impossible to improve. Each survey party was costing about $100 per day and there wasn't a way of getting around that. The cost figures showed that parties were averaging 30 soundings an hour for 8 continuous hours, counting bad weather, rough water, office plotting, and computation. Vance realized he could not ask men to work much harder than that.

Why Not Make Their Work Easier?

Vance visualized improved fathometer soundings at the unheard-of rate of 200 per minute, as the survey ship stepped out at the rate of 7 knots. He imagined a radar unit which would track and automatically spot the ship on a chart whenever survey men on the ship pulled a trigger device. For the trigger would activate, by radio, the automatic plotter on the radar set. With radio communication to assist in directing operations, it seemed that fog and haze could not interfere ever again with important offshore survey work.

All the experimental work conducted through the past year has been aimed at that goal. Despite a worn-out radar gear which saw service in the Italian campaigns, high standards of accuracy have been set. Word has quietly gotten around, and the Galveston District Office is being besieged with letters for information. Several interested Government offices have already sent representatives there. The U. S. Bureau of Reclamation is studying the possibility of surveying great reservoirs behind its dams, and of correlating silting studies by radar positioning.

Other fogbound districts along the coastlines of the United States see great possibilities in the experiments. It is generally realized that, when the fog and darkness of night come down upon a harbor, the water surface is then in its calmest state. More than once when sounding conditions were quite favorable, surveyors have had to stay in because fog or haze obscured everything.

The Galveston District secured most of the equipment for the experiment at no cost through a routine transfer of property between Government departments. Valued at about $200,000, the equipment consists of the following:

Survey Boat Galvez

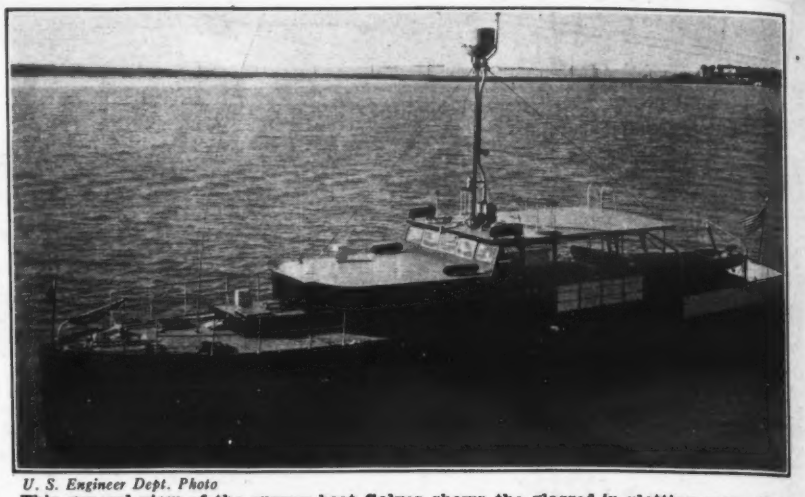
The survey boat Galvez has an overall length of 80 feet, and beam overplanking of 15 feet. Its maximum draft is 5 feet 5 inches. It has three rooms for sleeping eight people: a boat crew of four and a survey party of four. A small galley equipped with electric refrigeration and a gas stove to serve eight men is just off the dining or plotting room. The remaining central below-deck area is divided into two rooms, the engine room and the electrical generator room. Shower and toilets are also available aft and forward below deck.

The Galvez is powered by two Winton 6-cylinder diesels, rated at 200 hp at 700 rpm. Electrical equipment is operated by two General Motors 40-hp diesels driving 20-kw generator sets. One set will operate all electrical equipment, leaving the other as a stand-by. All auxiliary equipment for the SO-8 radar and fathometer are also in the generator room.

The plotting room, equipped with recording fathometer, AM and FM radio, SO-8 search-type radar, and intercommunication system to the bridge, is located above deck in a glassed-in salon forward of the bridge. It is used as a dining room at mealtime. Two small railings for sextant readers are located above the bridge; they are used for positioning when the land radar is not in use, or for occasional checking of radar data. Survey equipment is listed and described under the following subtitles:

Recording Fathometer

The recording fathometer in the plotting room is an improved type manufactured by the Submarine Signal Co. of Boston. It is a Type 788-A, and will record water depths below mean low tide. Draft and tide corrections are made on the machine. Tide readings are flashed by radio from shore at one-hour intervals, and the general tide fluctuation is about 2 feet. A fix button on the machine marks the chart at instants that horizontal position is obtained. The fix on the graph is marked to agree with the water-area map, so that the correct soundings can be put on actual position on the area chart.



U. S. Engineer Dept. Photo
This general view of the survey boat Galvez shows the glassed-in plotting room, the SO-8 Navy search-type radar rounded at the top, and the two sextant platforms used for positioning when the land radar is not in use.

FM Radio

The General Electric FM transmitter and receiver are located in the plotting room. This radio is used for maintaining continuous and direct communication between the Galvez and the mobile SCR-584B radar land station, where a similar FM unit is installed. All directions and positioning data from the land station are obtained over the FM radio. Used solely for survey work, it was selected because it would transmit clear azimuth and range readings without static interference, and do away with time delays from repeating.

AM Radio

The AM radio telephone is on the regular Galveston District 2,350-kilocycle band. It is used for communication with the District Office, the local field offices, and other boats of the District or the District Boat Yard at Fort Point. The radio telephone can also be operated from the bridge.

Intercommunication System

The Teletalk-type intercommunication system between the plotting room, bridge, and sextant readers on the top deck is used for directing the helmsman during survey runs, or for timing the positioning when sextants are used.

Responder Beacon

The responder beacon, mounted on the top deck, is used during radar location, or positioning. The radar beam from the land SCR-584B set activates the responder beacon, which in its turn then sends out a coded signal. This coded signal appears on the PPI (Plane Position Indicator) scope of the radar land station, and clearly establishes the position data as that of the Galvez. During periods of heavy haze and fog, survey work can be performed with radar when all other usual methods are impossible. Positions of other vessels in the area can be seen on the PPI scope, but the coded signal readily identifies the Galvez.

Vance believes that even third-order triangulation is possible, by placing the responder beacon on established U. S. Coast and Geodetic Surveys monuments, and shooting data by setting up the land radar station on other monuments. He believes the entire Galveston Bay area can be triangulated with radar at the South Jetty near Galveston Harbor. This may be attempted in 1947, and the results should be known before the end of the year.

SO-8 Navy Search-Type Radar

The search radar is located in the plotting room. It is used only for navigational purposes. It has a PPI scope with range-circle markings for the 4, 20, and 80-mile settings. The PPI scope is simply a television screen, activated through cathode-ray tubes. At each setting this PPI scope will show all objects in 4, 20, or 80 miles. It is practically the same equipment as the present navigational aid called Pathfinder. Recently a ship was controlled in New York Harbor from a blacked-out cabin with a similar type of radar.

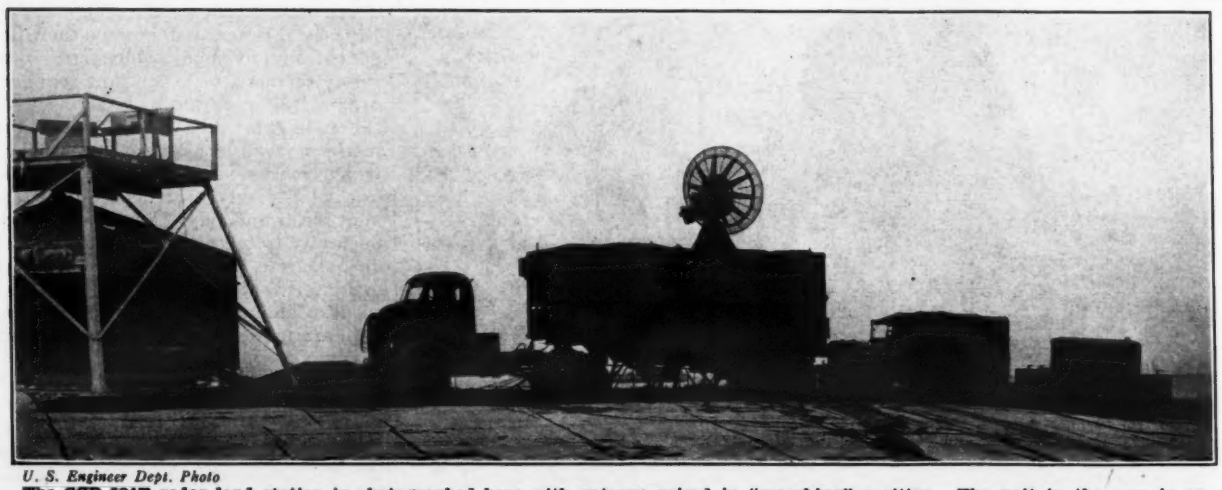
The search radar locates all objects or vessels in the area, and is used for approaching and entering jetty channels when fog obscures visibility during offshore survey work. Collisions when fog appears suddenly are now a thing of the past, with SO-8.

Mobile Radar Land Station

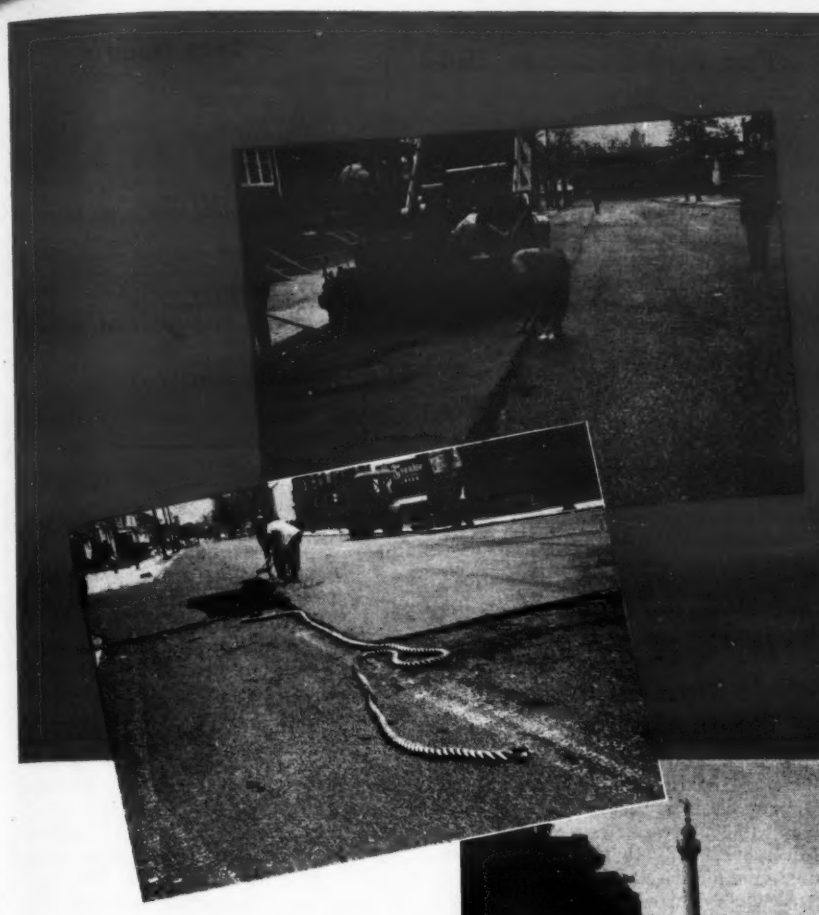
The brain of the entire outfit is a standard Type SCR-584B radar unit. It consists of a large 20,000-pound truck-drawn van, with all equipment and controls mounted inside. The antenna is lowered down inside the center of the van roof when traveling, and raised to a position above the roof when operating. The antenna is oriented to true north, or O-mils azimuth, by means of computed azimuths to known points such as jetty lights, USC&GS markers, etc.

The antenna is then positioned on the Galvez by reading the azimuth from the PPI scope. A technician flips a switch, magic fingers reach out, and the delicate machine automatically tracks the survey boat. It is uncanny, weird. But the technicians who learned the secrets of SCR-584B during the war as servicemen are among the happiest employees of the Galveston Engineer District, for they feel that they are putting their wartime knowledge to use.

(Continued on page 78)



U. S. Engineer Dept. Photo
The SCR-584B radar land station is photographed here with antenna raised in "searching" position. The unit in the rear is an M-7 generator set. The station is set up on a USC&GS monument on Galveston jetty near Fort Point, Texas.



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(right) For 21 years, this Texaco Sheet Asphalt pavement has served the heavy traffic of Broad Street, Trenton, N.J.

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Contractors and Engineers Monthly

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Member of Controlled Circulation Audit

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Better Inspection

How good is the inspection on a construction project? We believe it is better than some of the materials used. But it can stand a good deal of attention.

In the first place, many competent inspectors have gone on to other employers for better pay. For the occasional old guard left on a project these days, there are a dozen new characters like the little man who bustled up to the grizzled old concrete inspector on a job recently and announced, "I'm here to check this concrete. How's it coming?"

"What do you care how it's coming?" growled the inspector. "I thought this concrete was my responsibility, according to the resident engineer. When did that arrangement change?"

"It changed when I was assigned here to this project," the little man answered. "Look here," and he pulled out an identification card. "It says 'Inspector, General Construction'. I interpret that to mean I'm supposed to look after everything as a sort of superior!"

"You're a sort of damned fool!" roared the old man. "My advice to you is to see the resident engineer and find out exactly what you're supposed to be, besides excess baggage."

The old inspector, of course, was perfectly right about excess baggage. But merely calling a man by that name is not sufficient. The great problem facing the engineer or the department head nowadays is how to take such excess baggage and develop it into a first-grade construction inspector.

We all know the prominent part good sound design plays in any piece of engineering. We know what good contractor workmanship means. We know, too, that a reliable engineer directing a job sets up a desirable system of checks and balances. All this goes without saying.

But we also know that the tendency to slipshod work is inevitable when human beings hurry, that inspection serves a purpose even with reliable contractors, and that no design is better than its inspection.

And an engineer is no better than his field force of inspectors. We know of one engineer who directed the construction of several dams. So long as he retained good trained inspectors and surveyors, his reputation skyrocketed. When his best inspectors quit—he kept their salaries under $200 per month when he could have boosted them—his professional standing went too. He has since been discharged himself.

Responsibility for developing excess baggage pieces into first-grade inspectors, we feel, rests with the "front office". And there a long step in the right direction would be to clarify specifications. Dubious phrasing should be eliminated. Tolerances should be set forth clearly. Any wording capable of misinterpretation should be rewritten.

The specifications *must* be crystal-clear, if they are to be enforced intelligently. For them to be otherwise indicates that the contracting agency itself is in some doubt as to what it desires. Setting forth exactly what is wanted in clear simple English should go a long way towards the development of valuable inspectors.

Closer cooperation between designers and the field ought to be developed. Certainly field employees would become more conversant with their work and interested in it if designers adopted an approachable attitude. We definitely recommend to the designer an occasional field trip to one of his projects under construction.

More inducements for advancement should be offered to the individual inspector. His salary should rise with his capabilities. If he demonstrates ability, sound judgement, intelligence, ability to work with others, a genuine interest in construction and has the necessary technical knowledge, he should be promoted to a resident engineer's position. More rewards for being a good man should be offered than repeated chances to prove it at the same salary.

Six good inspectors on a job are far better than ten bad ones. For that reason, the front office must get rid of the extras. An inspector should have to keep reasonably busy on his shift to oversee the operations under his jurisdiction. It has been our observation that one busy inspector can accomplish much more than three idle ones. Debate, discussion, and visiting are all honorable activities, but not among inspectors on a construction job. The good resident engineer will keep his inspectors as carefully balanced as the superintendent spaces trucks under a shovel.

Finally—and this perhaps is most important—effective authority must be set up to weed out the incompetent inspector who refuses to develop into first-rate stuff. Such an inspector is a liability to his employer. It is unfair to ask a competent contractor to tolerate interference or take orders from this kind of inspector. Too often such a man is transferred to another project. He should be fired at once.

Only by overhauling this vital part of our excellent contract system can the inspection force grow to its full dignity and value.

Adopt the new Bond-a-Month plan and thus help yourself and your country. Regular investment in U. S. Savings Bonds helps the national economy by taking surplus cash out of the consumer market while prices are high and laying it aside for future use.

This easy and beneficial investment plan, to be offered by banks throughout the country beginning this month, extends to millions of Americans the privilege of regular purchase of U. S. Savings Bonds. Take advantage of it.

Road Show Scheduled For Mid-Summer, 1948

The date of the first post-war Road Show of the American Road Builders' Association has been set for July 16-24, 1948. It will be held in Soldier Field in Chicago.

This site will give construction equipment manufacturers plenty of outdoor space to display their machines. And exhibits requiring cover will be taken care of in enclosed exhibition halls. Soldier Field offers a total of 100,000 square feet of hall space and 1,000,000 square feet of paved open area.

Tentative plans for holding the event next February at the Chicago Dodge plant were abandoned when investigation revealed adequate inside space would not be available there or in any other site considered.

Because of the lapse of eight years since the last show, it was decided to extend this one to nine full days. The ARBA states that ample hotel space has been arranged for during the show.

Road-Maintenance Costs Up 35 Per Cent

Figures on the comparative cost of highway maintenance in 1941 and 1945 were released at the 26th annual meeting of the Highway Research Board last December. J. S. Bright, Deputy Commissioner of the Public Roads Administration, reported that they show a sharp rise in totals as well as unit costs.

In order to evaluate properly the amount of maintenance performed in any particular year in relation to the amount of money expended, it is first necessary to determine the production value of the maintenance dollar for each year. To make this determination for 1941 vs. 1945, the percentage increase for each of the cost factors—labor, materials, equipment rental, and overhead—was computed from reports the states submitted on the special maintenance cost sections.

The 1941 unit cost of each subfactor, such as the cost per gallon of a particular grade of asphalt or the cost per ton of a particular size of stone, was compared with the cost of the same item on the same section in 1945. Thus the percentage increase was determined. A weighted average of these subfactors was then made to determine the percentage cost increase for each factor. The proportionate weight of each subfactor was determined by computing the proportion that the cost of each material or service had to the total cost.

A summary of the results shows the following: the 1945 composite costs of labor increased 42 per cent over 1941; materials were up 30 per cent; equipment rental was up 29 per cent; overhead increased 27 per cent; and the total cost of performing maintenance operations was up 35 per cent.

The 1941 maintenance expenditures were $203,010,980 on the state system and $659,000,000 on the total system. This would indicate that normal maintenance requirements in 1945 were $274,064,823 for the state system and $890,000,000 for the total system of the nation. Maintenance deferred during the war totals $258,000,000 on the state system and $1,158,000,000 on the total system.

Reports indicate that some states have not increased their budgets in proportion to these increased costs. This large maintenance obligation indicates the need for further study of our present maintenance methods and practices. The objective of such study should be to reduce unit maintenance costs and secure a better standard of maintenance. Reports also indicate that the use of mechanical methods will reduce the cost of at least two common maintenance operations by about 50 per cent.

Plan Airport Show, School

Plans have been laid for an airport show and institute this autumn, sponsored by the National Aeronautic Association and the Air Foundation. The dates have been set for November 4 through 7. It will be held in the Cleveland Municipal Auditorium.

Four courses have been scheduled: (1) community airport, air-park, and air-harbor planning and development; (2) airport economics; (3) airport design, engineering, and construction; (4) maintenance and operation.

Admission to the exhibits will be free. A charge will be made to those participating in the institute to cover the cost of textbooks and laboratory materials. Those interested may communicate with Lowell Swenson, 1025 Connecticut Ave., Washington, D. C.

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HOLLAND REPAIRS HER BRIDGES

British Combine Photo

During the German retreat from Holland the majority of bridges, large and small, were destroyed. Since the autumn of 1944, when the southern provinces were liberated, more than 3,000 bridges have been wholly or partially restored. This view shows the damage to the St. Servatius bridge, Maastricht, and the structure now in use.

Here's the "Reason-Why"

WATER DISTRIBUTOR plus SEAMAN MIXER plus ROLLER

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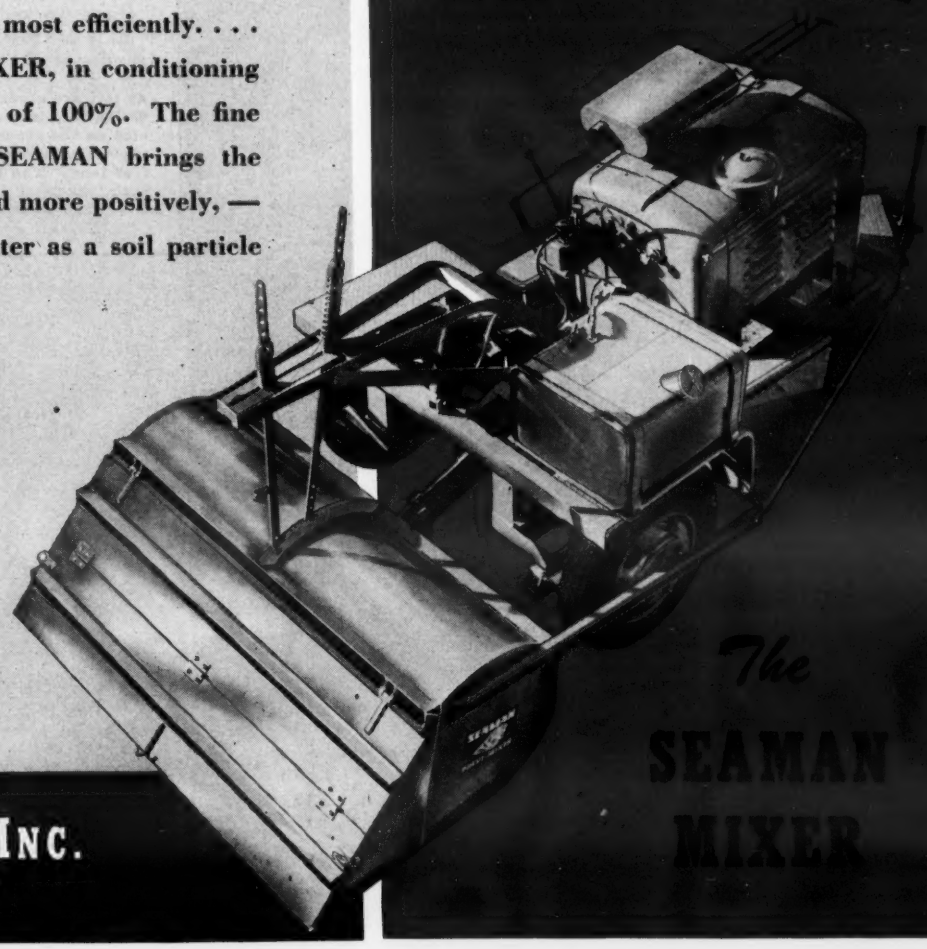


The SEAMAN MIXER

SEAMAN MOTORS, INC.
MILWAUKEE 3, WISCONSIN

Concrete-Pile Bents Replace Wood Spans

Project Extends 5 Miles; Includes Approach Fills, Six Trestle Bridges, and Main River Crossing

By WILLIAM H. QUIRK,
Eastern Editor

✦ WHERE the Great Pee Dee River flows through South Carolina just east of the old town of Society Hill, a great highway-bridge project on U. S. 15 is under construction. The work has been divided into two large contracts, the major one awarded to Wannamaker & Wells, Inc., of Orangeburg, S. C. It includes 4,800 feet of concrete-pile bents with 30-foot concrete-deck spans.

This overall length is divided into six bridges; one of them is built as an approach to the main river span; the other five are overflow bridges extending back across the flat swampy area of Marlboro County on the eastern shore of the river. On the western shore the river runs along a high bluff requiring no overflow spans.

The total length of the job is about 5 miles. It includes intervening roadway fills between the concrete-trestle bridges, and the main river crossing of 585 feet. The latter portion of the work involves the construction of six concrete piers and one end bent; this contract is being handled by the Bowers Construction Co. of Raleigh, N. C.

The new work parallels the old, being slightly to the south or downstream of the now outmoded system of bridges. The old system consists of the main river crossing with three steel truss spans, each 172 feet long, supported on concrete piers and having a roadway width of only 16 feet 10 inches; and six creosoted-timber trestle bridges with a roadway width of 22 feet. Embankment fills also connect the old bridges. The truss spans were constructed in 1924 while the trestle bents have been rebuilt a couple of times since then. Entirely on new location, the work under construction is designed for an H15-S12 live load. It will have a 26-foot roadway throughout with a 2½-foot sidewalk on each side.

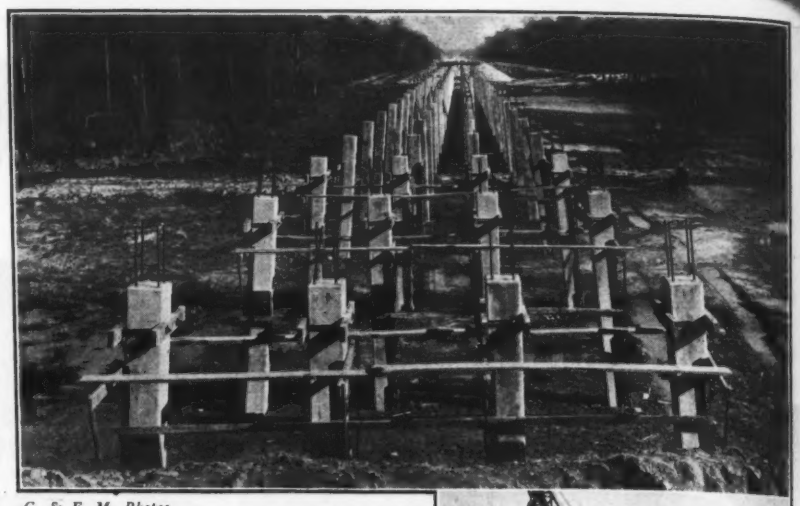
Casting and Driving Piles

Work on the Wannamaker & Wells, Inc., contract for the six concrete-trestle bridges got under way in May, 1946. At that time the Boney Construction Co. of Norfolk, Va., began casting the 18-inch square reinforced-concrete piles on a subcontract. These piles range in length from 36 to 42 feet and the reinforcing includes eight 1-inch round bars. Four of these bars, one at each corner, protruded 2½ feet beyond the head of the pile after driving was completed. They were then bent over, two to a side, so that they bond into the caps which were poured in place. The heads of the piles project 2 inches into the caps.

The subcontractor, with T. C. Carr as Superintendent, set up a pile-casting yard at Bennettsville, about 12 miles northeast of the site, and hauled the 680 piles required for the job on trailer trucks. Driving was also done by the subcontractor. He used a Marion crane with an 85-foot boom and an oil-burning 60-hp boiler which supplied steam for the Vulcan No. 1 hammer.

A template made of two 12 x 12's was first located on the ground where the four piles in each bent were to be driven. The two inside piles are plumb, and the outer piles are battered 1 inch in 12. A double set of steel leads, 40 feet long, with one side plumb and the other constructed to the proper batter, was used to control the piles while they were being driven to at least a 22-foot penetration.

No abnormal high water occurred in the Great Pee Dee last summer and autumn. So the sites of the six bridges remained dry enough for the crane to keep working along on wooden mats. This phase of the project was completed in November. Ordinarily the ground beneath these overflow bridges is dry, but in flood times the river backs up and then the bridges really cross deep water.



C. & E. M. Photos

Bridge 3 on the Wannamaker & Wells contract, 990 feet long, is shown above with piles driven and ready for capping. Around the tops of the piles 3 x 8's are bolted and held there by skin friction to support the 8 x 8's on which the falsework will rest. At right, subcontractor Boney uses a Vulcan No. 1 hammer on a Marion crane with an 85-foot boom to drive piles. The crane's oil-burning 60-hp boiler supplied steam for the hammer as it worked in a double set of 40-foot steel leads.

Concrete Work

By July enough piles were in the ground for the prime contractor to begin pouring the caps which are 2 feet deep, 2½ feet wide, and 25½ feet long. A batch plant had been set up on the right bank of the river, just north of the old road, on a siding of the Atlantic Coast Line Railroad. Crushed stone had been the choice for coarse aggregate in the pile casting, but gravel was used for the caps and decks.

The gravel and sand were purchased from the Becker County Sand & Gravel Co. located at Cheraw, S. C. The material was shipped 20 miles in gondola cars over the ACL to the siding. There it was unloaded by a P&H Model 206 crane equipped with a 40-foot boom and an Owen ¾-yard clamshell bucket. The crane worked from a wooden platform built up to the level of the car floor and stockpiled the fine and coarse aggregate on either side of a Johnson 50-ton bin. It also kept this bin charged during the concreting.

Five trucks were used, as a rule, in hauling the batches: three Fords, a Chevrolet, and a Reo. Each had two compartments for holding a batch. After backing under the aggregate bin to pick up a load, the trucks moved ahead about 200 feet to pick up the cement at the storage shed. About 2,000 bags of Penn Dixie cement, shipped from Clinchfield, Ga., were usually kept on hand. After the cement was loaded by hand, the batch trucks crossed the river on the original bridge, which is about ¼ mile upstream from the new work. Then they left the old road to continue

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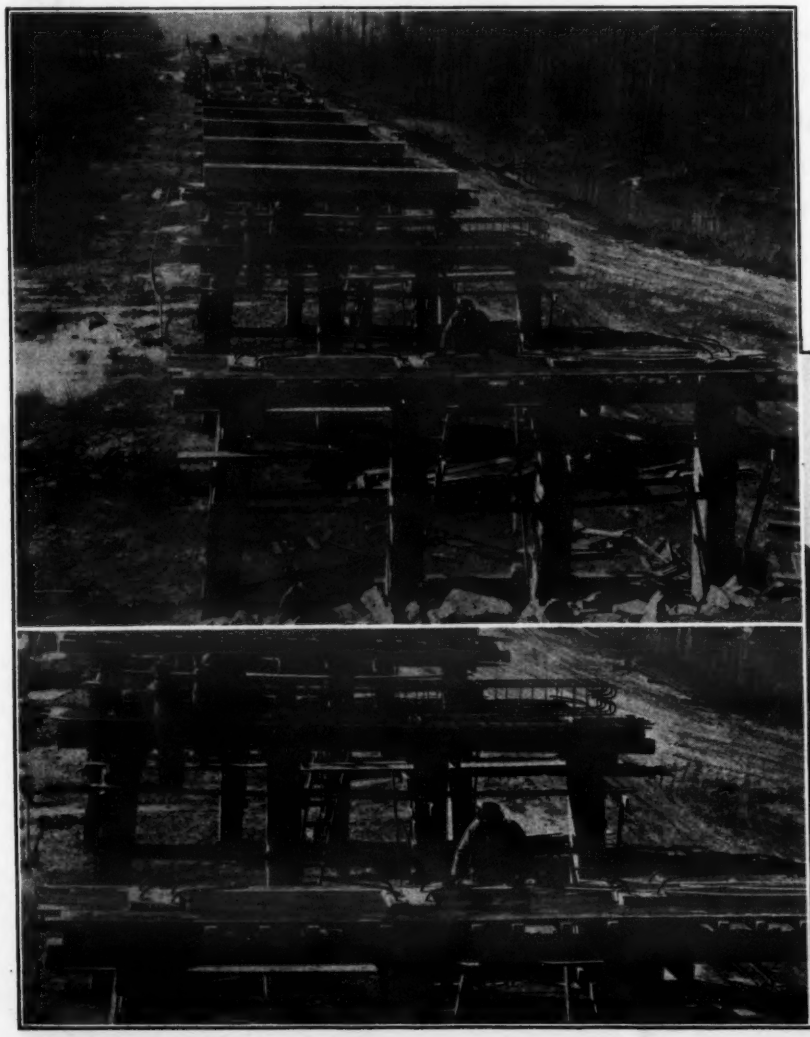

At left are a general view and close-up of Bridge 4 under construction by Wannamaker & Wells, Inc., on U. S. 15 near Society Hill, S. C. Cages of reinforcing steel previously assembled on the ground are being hoisted into position and set in place for a bridge cap. Later, cap forms are built around the steel. These caps are 2 feet deep, 2½ feet wide, and 25½ feet long. The Unit crane shown in the picture below handled the reinforcing steel and form panels as well as the concrete buckets. Here it was photographed with its 50-foot boom and 8-foot jib swinging a ½-yard bucket of concrete from a Smith 27-E paver.

C. & E. M. Photos

C. & E. M. Photo
The Unit crane used on the Wannamaker & Wells contract picks up paver gear preparatory to moving to another site on the job.

Concrete-Pile Bents Replace Wood Spans

(Continued from preceding page)

across the flats to where the pour was being made.

The bulk of the concrete mixing was done by a Smith 27-E paver with 6-bag batches. Later when the caps and decks were poured, concrete for the handrails was mixed in two Jaeger mixers, a 3-bag and a 2-bag unit.

Forms

After the piles were driven, two 3 x 8's were framed near the top of each, one on each side running lengthwise of the bridge and projecting about 12 inches beyond the sides of the piles. These pieces were secured in place with 1-inch bolts, and held against the concrete by skin friction. On top of the 3 x 8's and running transversely with the bridge, an 8 x 8 was laid on each side of the piles. Similar bolts were also put through these timbers which were secured both by skin friction and from the support afforded by the 3 x 8's. Most of the heavier supporting timbers were of oak. Across the 8 x 8's and supported by them were laid 4 x 4 stringers on 12-inch centers on which the 1¼-inch stock was constructed for the cap bottom.

The cages of reinforcing steel which had been assembled on the ground were then hoisted into position and steel forms built around them. Since the bottom forms had to remain on much longer than the side forms, it was considered more practical to use wood for the cap bottoms. Steel forms, however, were used also for the deck, sidewalks, and handrails. The reinforcing steel came from the Alabama Steel Co. at Birmingham, Ala., and was shipped by rail to the ACL siding at Society Hill.

After the caps were poured and the side forms removed, double 6-inch channels were laid across the top of the cap at each side of each concrete girder. They were connected to the 8 x 8's beneath by rods with bolted ends which passed through steel plates at top and bottom. This arrangement gave support for the deck falsework which was built up on four steel 18-inch 47-pound I-beams, one under each reinforced-concrete deck girder. It also permitted the forms to be removed easily by taking off the nuts and bottom plates and lowering the whole falsework to the ground by a fall block.

Across the I-beams 2 x 6 stringers were laid on 18-inch centers to support the beam bottom forms made up of 1¼-inch stock. The beam bottom forms remained in place 15 days after the pours, but the steel side forms were dismantled at the end of 5 days. To support the 2½-foot sidewalk bracket on each side, which is of cantilever construction, four knee braces were constructed of 6 x 6's and tied in to the outside steel beam. The steel deck forms were ⅛ inch thick and came in 18-inch panels. These were lined up by using nails as dowels in matching holes in adjacent forms, and were then fastened together with hand latches.

C. & E. M. Photo
Steel deck forms are assembled for the Wannamaker & Wells highway-bridge contract in South Carolina. The forms were ⅛ inch thick and came in 18-inch panels.

For cutting the timbers and form lumber, a carpenter shop was set up at the bridge site. A Beach 16-inch-blade table saw driven by a Wisconsin engine did most of the heavy cutting.

Construction Features

The pile driving was completed by the end of November, 1946, and work

(Continued on next page)

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Concrete-Pile Bents Replace Wood Spans

(*Continued from preceding page*)

on the caps and deck followed in order. Besides the crane at the batch plant, two other cranes were used on the job. One was a new Unit crane with a 50-foot boom and an 8-foot jib, which gave it the equivalent of a 65-foot lift. It handled the reinforcing steel, the form panels, and the ½-yard concrete buckets for conveying the concrete from the paver to the forms. Another crane for general use was a Bucyrus-Erie with a 28-foot boom. The short boom enabled it to run under the bridges and handle the forms after they were lowered to the ground following a pour.

Water for the concrete was pumped from the river by two Novo 2-inch pumps through a 2-inch line to two horizontal storage tanks, one of 5,000 and one of 4,000-gallon capacity. These tanks were built up on timber cradles and were moved about from bridge to bridge by one of the cranes, or snaked along the bottomlands by a Caterpillar D4 tractor. All concrete was vibrated by either a Viber, Jackson, or Mall unit. During favorable weather three deck slabs on an average were poured in a week.

The slabs are 6⅞ inches thick at the center and 6½ inches at the edges with a 1¾-inch parabolic crown. They are supported by four girders 13½ inches wide with an average 2-foot depth, spaced 7 feet 6⅛ inches on centers. Across the middle of each span and at the ends are diaphragms 10½ inches deep x 10 inches wide. A 1-inch opening is left every 60 feet for expansion, but these joints are later filled with mastic.

To give the deck a non-skid surface and to afford better traction, the finishers drew a steel-toothed lawn rake over the concrete before it had set, making grooves ⅛ inch deep and 1 inch apart. The concrete was cured with Kapco compound applied at the rate of 1 gallon for 200 square feet by a Garden Master 3-gallon sprayer and a 95-gallon Smith Indian fire pump. The exposed surfaces of the superstructure on the outside were rubbed down by the finishers who kept the forms on not less than 14 nor more than 48 hours to get

C. & E. M. Photo

A Reo truck dumps a dry batch into a Smith 27-E paver. This unit was used for most of the concrete mixing on a 5-mile highway-bridge job over the Great Pee Dee River.

the best results with their work. When the temperature dropped below 40 degrees F it was not considered curing time.

The finishers worked from rubbing platforms, one on each side of the bridge. These consisted of a hanging scaffold supported by a wooden carriage which moved on four rubber-tired wheels, two running on the sidewalk and two on the deck. The framework over the deck wheels was weighted with sandbags as a counterbalance. A Kohler 1½-kw electric light plant was available when the finishers were caught by darkness before they were through. This plant also furnished current for electric vibrators and drills.

The 2½-foot sidewalks are protected by a railing. Concrete posts 2 feet high, spaced 8 feet 9 inches on centers, support the concrete railing, 8 x 10 inches, partially imbedded in the posts. Each post is surmounted by a steel bracket through which runs a pipe railing. The concrete railing was usually poured with the smaller mixers located on the deck, using the metal forms which came in 9-foot 7-inch sections. An average of 60 feet of railing, or 30 feet on each side, was poured in a 9-hour day.

For maintenance of the steel forms and for other metal work, a blacksmith shop was set up on the site. It consisted of a 2-foot circular forge with a

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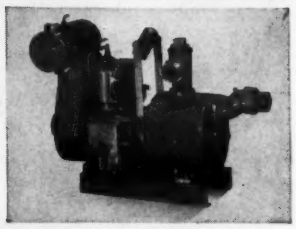

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Concrete-Pile Bents Replace Wood Spans

(Continued from preceding page)

Champion blower, a 200-pound anvil, an oxyacetylene welding unit, and a Lincoln 200-amp electric welder. A metal tool house was built on skids so that it could easily be pulled around by the tractor from bridge to bridge.

The shortest of the six bridges is 300 feet long, while the longest has a span of 1,350 feet. The others are 420, 750, and two at 990 feet. For added strength and rigidity extra piles have been driven either at the one-third or mid points of the three longest bridges in a direction at right angles to the bent itself, thereby increasing the number of piles at those bents from 4 to 6. They are then known as spur or tower bents.

Quantities and Personnel

The major items involved in the Wannamaker & Wells, Inc., contract for $547,154.92 include:

Class A concrete, caps and superstructure	6,455 cu. yds.
Reinforcing steel	1,421,122 lbs.
Precast concrete piles, 18-inch	24,900 lin. ft.

W. E. Copeland is Superintendent for the contractor, while J. V. Dunbar is Resident Engineer in charge for the South Carolina Highway Department on all the bridge work at this site.

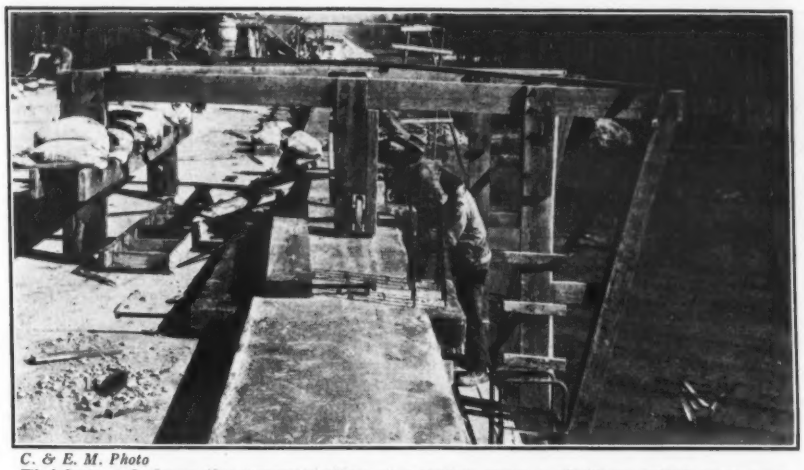
Main River Span

So far, only the construction of the six concrete piers and one end bent has been contracted for on the main river crossing. The Bowers Construction Co. of Raleigh, N. C., got the job on its low bid of $100,621.48, and the contract for the superstructure will be awarded later. Construction began early in December, 1946, but high water on the river caused several interruptions particularly along the right bank where the water is 16 feet deep.

The concrete end bent was constructed on this side resting on a foundation of 30-foot creosoted piles; so was one of the piers. The others are being constructed from a timber-trestle work bridge built out from the left bank where the water is shallower. The piers are from 42 to 56 feet high and are being constructed in open cofferdams made of steel sheeting. After the cofferdams are unwatered, 25-foot timber foundation piles are driven in the dry.

The major items in the pier contract include:

Excavation, dry	885 cu. yds.
Excavation, wet	1,120 cu. yds.
Concrete	1,108 cu. yds.
Reinforcing steel	53,023 cu. yds.
Untreated-timber piles	6,000 lin. ft.
Creosoted-timber piles	420 lin. ft.



C. & E. M. Photo

Finishers rub down the concrete sides of a bridge from a platform which moves on four rubber-tired wheels, two running on the sidewalk and two on the deck. The framework over the deck wheels is weighted down with sandbags as a counterbalance. A similar platform was used on the other side of the bridge.

By mid-summer the piers will be completed, and another contract will cover building the superstructure. This will include one 30-foot reinforced-concrete span, two 60-foot girder spans, and a 435-foot continuous-girder span.

The main river crossing will adjoin Bridge 6, the 750-foot approach concrete trestle. The new bridge is expected to be open for traffic in the autumn.

J. S. Williamson is Chief Highway Commissioner for the South Carolina Highway Department while C. R. McMillan is State Highway Engineer. W. J. Gooding, Jr., is Bridge Engineer.

Varied Uses for Graders

Many varied applications of Caterpillar diesel motor graders are outlined in an 8-page catalog issued by the Caterpillar Tractor Co., Peoria 8, Ill. The reasons for such usage and the advantages to the contractor are explained.

Form No. 10185 portrays the motor grader as a companion to the tractor, bulldozer, and scraper. On-the-job pictures are supplemented by editorial comment concerning motor-grader versatility.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 91.

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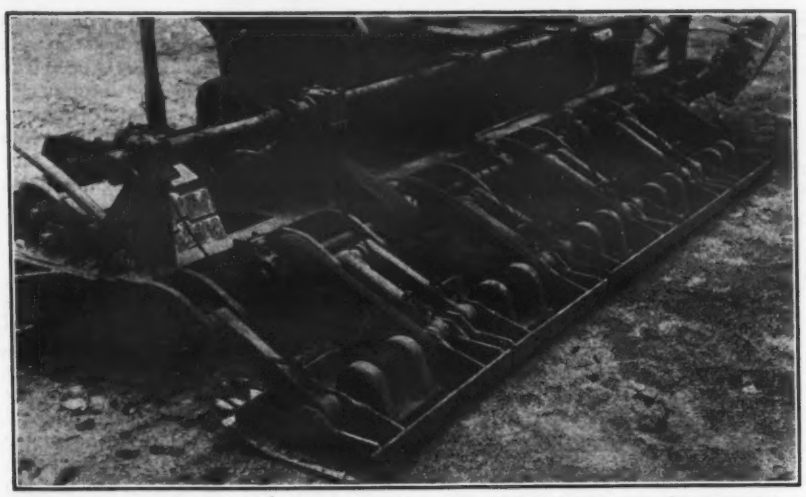

A new unit made by International Vibration Co. vibrates limestone screenings into macadam stone to fill the voids. The vibrator's six shoes deliver 3,600 impacts a minute. Two separate gasoline engines propel the vibrator and actuate the shoes.

Mechanical Vibrator For Macadam Roads

A mechanical vibrator for nesting macadam stone and vibrating fine screenings into coarse stone in macadam-pavement construction was recently demonstrated by the International Vibration Co., 16702 Waterloo Road, Cleveland, Ohio. The vibrator is designed for use in conjunction with the usual macadam rollers.

The mechanical vibrator weighs 6,000 pounds. It is propelled by a gasoline engine and rides on two crawler tracks. A separate engine actuates the six vibrating shoes which deliver 3,600 impacts per minute, according to the manufacturer. The unit moves forward at the rate of about 14 to 30 fpm.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 97.

Variety of Take-Offs Feature New Diesels

Changes and improvements in its Series 71 Twin-6 diesel engines have been announced by the Detroit Diesel Engine Division, General Motors Corp., 13400 W. Outer Drive, Detroit 23, Mich. The twin unit is made up of two basic GM 6-cylinder 2-cycle engines mounted side by side and geared to a single shaft. Units are offered with either right or left-hand rotation. Continuous bhp at 1,800 rpm is 276, with maximum intermittent rating of 400 at 2,000 rpm.

Four power take-off arrangements have been made available: (1) the heavy-duty power take-off designed to take pulley and chain drive side thrust without the need for a special cradle-mounted sheave or sprocket; (2) the stub shaft for use with any of the various types of couplings encountered with heavy-duty machinery; (3) the drive flange for installations where the driven machinery is to be connected directly to the power unit; (4) the 0-size or SAE housing designed to support any close-coupled power take-off within the proper horsepower range. Particular attention has been given to its application with torque converters.

Gear ratios of 1:1 direct drive, and 1.33:1, 1.77:1, and 2:1 reduction are available with each of the four transfer gear types. An increase in the shock-load capacity over earlier models has been accomplished by the introduction of improved heavy-duty transfer gears constructed with a 25 per cent increase in face width.

Engine units can be obtained with either radiator or heat-exchanger cooling systems, depending upon the nature of application. Specially designed flanges can be furnished for those installations employing remotely located radiators or cooling towers. Throttle controls have improved bearing areas. Component parts of the throttle mechanism follow the same design and are interchangeable with those used on the GM Quad-6 units.

The battery-charging generator, tachometer drive, and accessory drive are all connected to the gear box; this enables them to function when either of the two engines in the unit is not in operation. Dual electric starting motors are obtainable as an optional selection for the first time.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 49.

New Model Steam Cleaner

A bulletin describing its new Model MO-46B White-Ofeldt vapor steam cleaner is being distributed by White Engineering & Mfg. Co., Inc., 141 W. Passaic St., Rochelle Park, N. J. It is operated by a ½-hp 110-volt ac motor; dc or other voltage motors can be supplied. The unit is portable or stationary and features an automatic burner.

The announcement gives all of the specifications of the Model MO-46B, and describes the various cleaning compounds which are available for use with it. Included is a detail drawing of the unit showing its construction and other special features.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 63.

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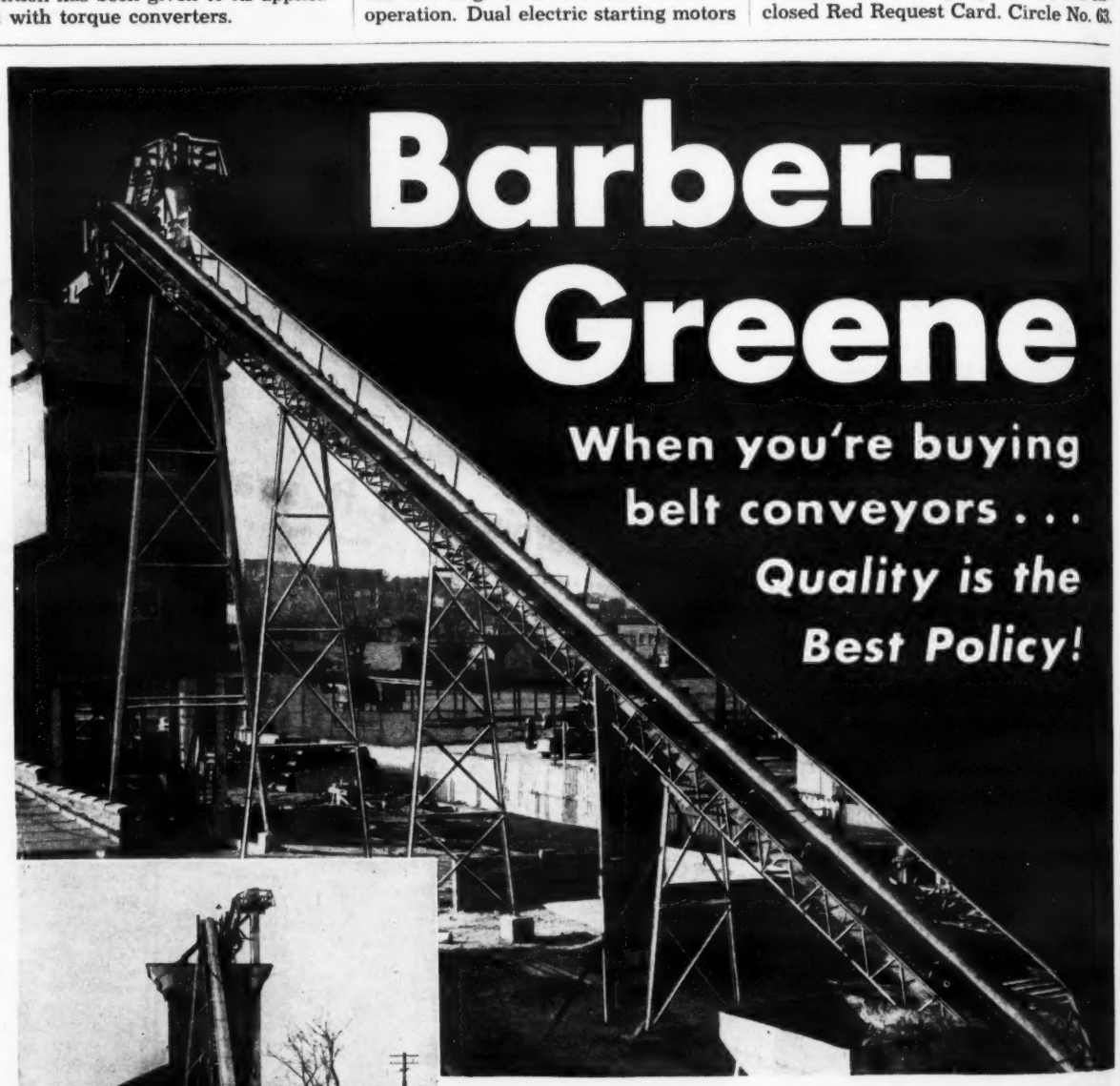

Belt Conveyors by Barber-Greene are examples of infinite attention to engineering detail. You see this from the minute they arrive: the plainly numbered carriers and support members, the easily followed erection print, the simplified assembly on the job that comes from their standardized design. The units themselves—carriers, trusses, walkways, drives and takeups—go still further in proving the value of belt conveyors that are quality engineered. They are designed to last through longer years of service. And they do just that—while moving bulk materials at a high production pace at a low cost per yard moved.

53

This B-G Belt Conveyor set-up makes efficient use of limited space: materials dumped into pits below tracks are carried to plant adjacent to spur.

BG

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Long Haul on Desert Highway Grading Job

Haul of 0.82 Mile Handled By Fast-Moving Machines; About 750,000 Yards Moved For 15-Mile Project

✦ MANY years before the coming of powered earth-moving machines, a then-obscure contracting firm, Morrison-Knudsen Co., cut its eyeteeth on southern Idaho volcanic ash. Today that same firm, known as Morrison-Knudsen Co., Inc., has multimillion-dollar work strung from China's Yangtze River to Switzerland's frontiers. And with the creation of a new Highway Construction Division, it has moved back to the scene of its early triumphs.

The first contract landed by the M-K Highway Construction Division was a 15.67-mile grading project, for $700,000, between Wendell and Bliss on Idaho State Route 25. About 750,000 cubic yards of dirt was moved in seven months from May 1, 1946, before the new highway crown could be shaped. It will have a finished width of 50 feet. A concrete-arch bridge 120 feet long across the Malad River was sublet to Jack C. Ketchen Co. Ketchen was formerly a Morrison-Knudsen superintendent.

About 500,000 cubic yards of imported borrow was hauled an average distance of 4,330 feet. Some hauls exceeded 1½ miles. The remaining 250,000 cubic yards was unclassified excavation in the roadway limits. And about 125,000 cubic yards of this was the toughest kind of volcanic rock to be found in all of Idaho. Hot summer weather, with volcanic dust as fine as flour and a foot deep, were just two of the conditions that made operations tough.

The headquarters town of Wendell, with a population of 725, had no housing facilities. Project Superintendent E. Roy Knight rented a vacant potato cellar, installed shower baths and bunks, and provided bus service from Wendell out to the job as an inducement to cat skinners and Cobra charmers. "The Boar's Nest", as the boys called the potato cellar, was not exactly a Statler hotel, but it served its purpose. Roy Knight believes in this kind of direct action. Up on the Northway, Alaska, Air Base during the war he had to employ it frequently.

Dirt Work

For its first highway contract, the road-building division moved in with a batch of new equipment selected especially for a long-haul job. Two Caterpillar No. 12 motor graders were brought in to maintain the smooth haul roads required by fast rubber-mounted dirt-moving machines. Three Caterpillar D8 tractors with LeTourneau Carryalls were used on the stripping of sagebrush and short-haul work. Two Caterpillar DW10 rubber-tired tractors with LaPlant-Choate Carrimor scrapers were also brought in.

But the bulk of long-haul borrow was handled by ten self-powered rubber-tired fast-moving Wooldridge Terra-Cobras. Weighing 22,000 pounds empty, these red devils are rated at from 14 cubic yards level to 18 yards heaped capacity. With a load of dirt, they weigh up to 55,000 pounds, and the ponderous machines require the very best haul roads. In their work on big dams, M-K muckers learned long ago that good roads must be maintained for rubber-tired equipment.

Red against the dusty gray desert, the Cobras moved in, working both ways from the center of the job. A big borrow pit was cleared of sagebrush, and a Caterpillar D8 with a pusher plate was assigned to heap the Cobras.

(Continued on next page)

C. & E. M. Photo
A Wooldridge Terra-Cobra dumps a load on the fill during the Morrison-Knudsen highway grading job on Idaho State Route 25. Some hauls exceeded 1½ miles.

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IF it's a smooth-running, fast-moving steel erecting job, you're certain to find a Lorain Moto-Crane holding the center of the stage. Rubber-tire mobility permits these units to service every phase of the work—unloading at the team track, sorting, distributing, erecting steel on the job—quickly and economically. Possessing the power and strength for a "belly lift" and the capacity and range for a boarding-house reach, Moto-Cranes measure up to the many varied precision handling requirements typical of such jobs.

Lorain Moto-Cranes are available in a wide range of capacities on 4 or 6 wheel rubber-tire mountings with or without front wheel drive. And they offer a combination of features that get steel up and costs down in a hurry. Ask your local Thew-Lorain distributor for complete information now.

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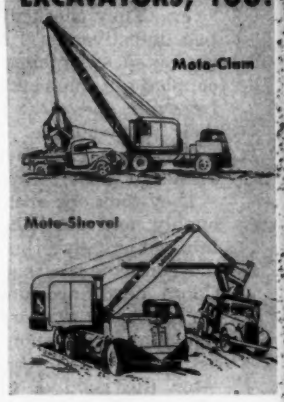

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Long Haul on Desert Highway Grading Job

(*Continued from preceding page*)

Four 2,000-gallon water tanks mounted on International K-11 trucks were brought up on the line to help the motor graders maintain haul roads. The material was composed mostly of volcanic cinders and ash, with some suspended gravel. It loaded fairly well. With both the Cobras and the D8 pushers in first gear, loads were frequently pushed up where a dirt foreman likes to see them—in the control cables at the back of the Cobra bowls.

Hauling a little more than a mile, the roaring Terra-Cobras started off hot by putting from 21 to 25 loads apiece on the fill every 8-hour shift. Seven double-drum sheepsfoot rollers, pulled by two Caterpillar D6 tractors, were hard pressed to keep the dirt tamped ahead of the Cobras.

Then trouble struck.

Licking the Trouble

Morrison-Knudsen Co., Inc., has trouble on some of its jobs the same as any general contractor. But the thing that makes this growing firm offer such keen competition on any type of work it does is the way it ferrets out the bugs when they appear.

The trouble on this job was probably a combination of haul roads and the high-pressure tubing on the Cobra hydraulic steering system. Very heavy hydraulic rams are necessary to turn a Cobra's massive wheels with a 15-yard load on its back, so to speak. The 22 feet of high-pressure airplane tubing is designed to stand pressure and vibration without leaking. Just the same, the Cobras were breaking down.

The expert cost-accounting department which M-K maintains on all its big jobs showed that Cobras down for a 15-minute repair job were standing idle for six and seven hours before mechanics were fixing the trouble. One machine with a 20-hour repair job was idle from June 24 to July 10. Roy Knight, normally a patient man, was ready to blow his top.

Larry Shull, Wooldridge Service Engineer from Sunnyvale, Calif., came up to check on Cobra field performance and to try to iron out the difficulty. M-K brought Al Wisnewsky, its top-notch traveling master mechanic. It was up to Wisnewsky to organize the mechanical force so that repairs would be speeded up . . . that was Roy Knight's order.

Wisnewsky and Shull then got their noses into the Cobra hydraulic steering system. When they lowered the oil pressure they reduced the positive Cobra steering, so that was not the answer. They checked everything. Like two detectives on a murder case, they suspected everything they touched. A coupled nut connection on the hydraulic reservoir above the rams came under their surveillance. Maybe this nut didn't have enough threads really to anchor it. They experimented.

They took one apart, cleaned it thoroughly, and put it back together with litharge and glycerin. After two weeks the connection was still tight, and the Cobra performed almost continuously. No hydraulic fluid was leaking. Shull shot that information in to Wooldridge designers. The next move will be theirs—for the good of contractors everywhere. The two trouble shooters then revamped the tubing system in one of the machines, reducing from 22 to 7 feet the amount of tubing it had used.

Performance took a jump—a good jump—but it was not enough to satisfy tough Roy Knight and portly Division Manager A. A. Walther. They demanded a mechanical department that would jump right on an idle machine and put it back on the line in the least possible time. They insisted on the kind of careful operation that would reduce breakdowns to a minimum, without sacrificing anything for dirt output. And they had a head start towards that objective at the time their first job was visited by CONTRACTORS AND ENGINEERS MONTHLY's Western Editor.

C. & E. M. Photo

A Caterpillar motor grader shapes fill on the Wendell-to-Bliss, Idaho, 15-mile grading job, and a hydraulic post-hole auger on a Case tractor digs holes for new fence.

They balanced down time against effective working time by fractions of one per cent. Reports came in from the master mechanic and the excavation foremen. They were correlated by an equipment cost accountant, posted daily to a large pad. The company paid a man to check load counts out of the borrow pit. It later balanced this count against cross-sectional survey measurements to see if its low estimate of 12 bank yards per Cobra load could safely be increased. This is the kind of management that has made the contract system a saver of public dollars, even in this inflated age.

When the job was about 30 per cent complete in mid-July, dirt was flying at the rate of 110,000 cubic yards a month for all units. It was on schedule, with the company boosting its output by improved maintenance and operation of machines. Two 8-hour shifts were worked, with equipment getting a grease and fuel servicing job once every 8 hours.

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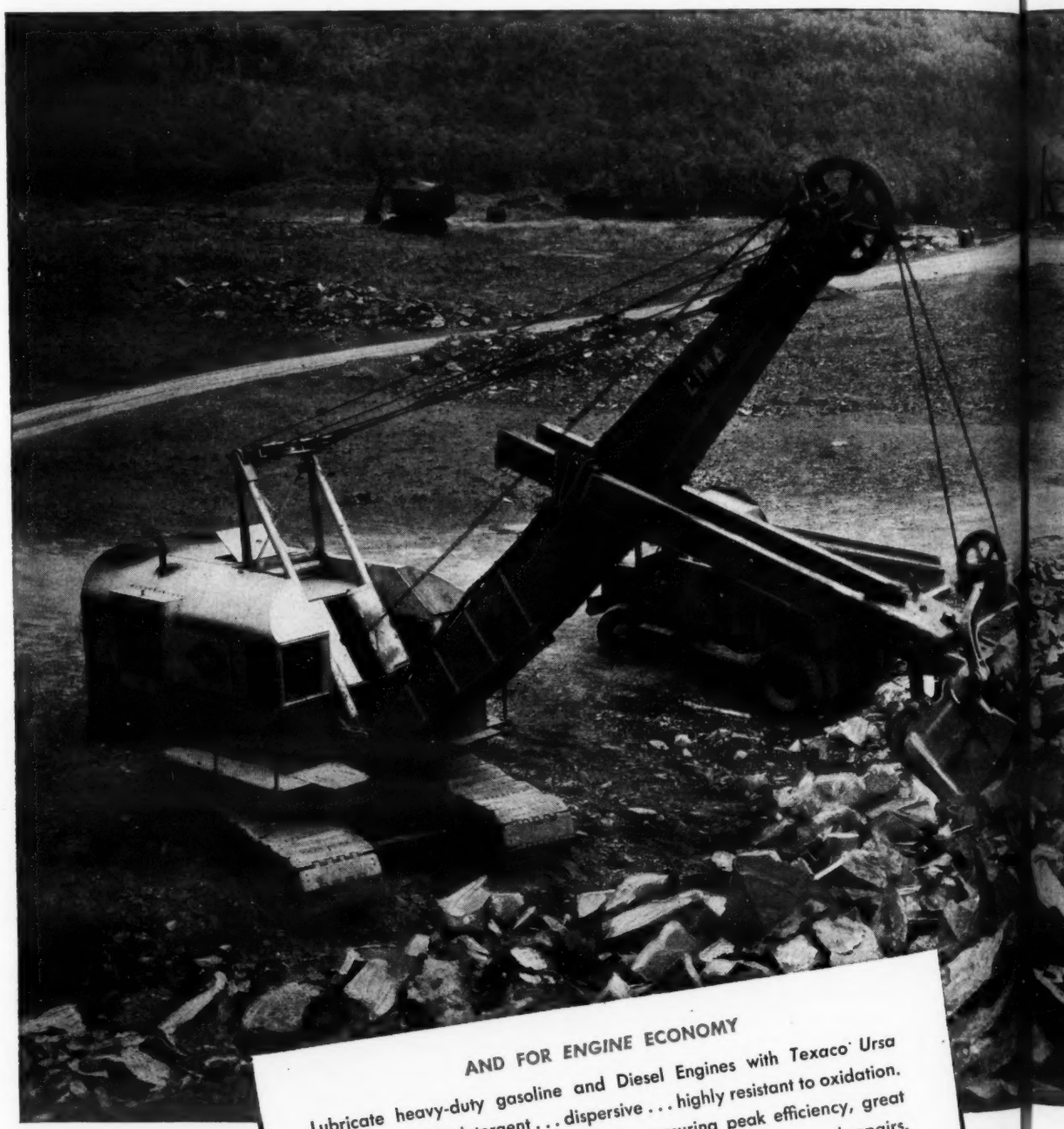

AND FOR ENGINE ECONOMY

Lubricate heavy-duty gasoline and Diesel Engines with Texaco Ursa Oil X★★. It's fully detergent . . . dispersive . . . highly resistant to oxidation. Ursa Oil X★★ keeps engines clean . . . assuring peak efficiency, great fuel economy, and savings all along the line on maintenance and repairs.

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TEXACO STAR THEATRE
presents the NEW
TONY MARTIN SHOW
every Sunday night.
See newspaper for time
and station.

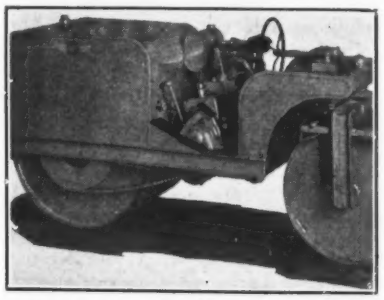
TEXACO
REG. T. M.

TEXACO

Lightweight Rollers In 1½ to 4-Ton Models

Rollers in three models, 1½ to 2 tons, 2 to 3 tons, and 3 to 4 tons, are made by the Essick Mfg. Co., 1950 Santa Fe Ave., Los Angeles 21, Calif. Model 200 has a total weight of 2,910 pounds; 4,270 pounds with water ballast.The rear roll when ballasted exerts 108 pounds of compression per square inch, and the guide roll exerts 39 pounds. The unit has a 68-inch wheelbase, a 9-foot length, 36-inch width, 49-inch height, and a 12-foot turning radius. It is powered by a 6-hp Wisconsin engine and will develop speeds up to 3 mph.

Model 300 weighs 4,120 pounds, and when ballasted with water, 5,360 pounds. Compression of the rear roll ballasted is 145 pounds per square inch; guide roll, 39 pounds. Wheelbase is 68 inches, length is 9 feet, width 36 inches, height 49 inches, and the unit has a turning radius of 12 feet. Power is furnished by a 9-hp Wisconsin engine and the roller will develop speeds up to 3 mph.



Essick rollers come in three models: 1½ to 2 tons, 2 to 3, and 3 to 4. They feature compressions from 60 to 160 pounds per square inch, sealed ball bearings, two speeds forward and two reverse, and heavy-duty Wisconsin air-cooled engines with Timken bearings.

The Model 400 has a weight of 4,780 pounds which can be increased to 7,390 pounds with water ballast. Compression of the rear wheel when ballasted is 160 pounds per inch; the guide roller, 39 pounds per inch. Wheelbase is 82½ inches, length is 10 feet 6 inches, width is 46 inches, height is 58 inches, and the unit has a turning radius of 14 feet. Power is obtained from a 16-hp Wisconsin engine, and speeds up to 4 mph can be developed.

Drive is directly from the engine and transmission to the compression roll by roller chain and sprockets. Steering gear is of the automotive-type of enclosed worm-gear construction. Trailers are made by Essick for easy transporting of the rollers.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 40.

LeTourneau Appointment

Robert P. Nichols has been appointed Assistant Domestic Sales Manager by R. G. LeTourneau, Inc., of Peoria, Ill. In his new capacity, he will assist S. D. Means, the company's Domestic Sales Manager.

THE LUBRICANT THAT

Cuts your maintenance costs

Nothing beats *Texaco Marfak* for "lubricating persistency". It's tough — holds together — and *stays in bearings* despite the squeeze of heavy loads and the pounding of rough service. *Marfak* also prevents dirt and moisture from getting in — gives longer-lasting protection that cuts maintenance costs.

In wheel bearings, use *Texaco Marfak Heavy Duty*. Its long lasting protection comes from its unique ability to provide a fluid lubricating film inside the bearing while retaining its original consistency at the outer edges — thus sealing itself in, sealing out dirt and moisture.

More than 250 million pounds of Marfak have been used to date! You couldn't ask for better proof of quality and performance.

Contractors everywhere gain many time- and money-saving advantages by using the Texaco Simplified Lubrication Plan. Ask about it. Call the nearest of the more than 2500 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

Long Haul on Desert Highway Grading Job

(*Continued from preceding page*)

Rock Excavation

One Ingersoll-Rand air compressor, one Worthington, and one Gardner-Denver, with a combined capacity of 1,350 cfs, were brought in with one Ingersoll-Rand and three Sullivan wagon drills and 15 Jackhamers for the rock work. The rock cuts were drilled on variable centers, depending on the hardness of the rock, but generally about 3 feet. Detachable bits, which could be sharpened about three times, were used.

About ¾ pound of 40 per cent powder per cubic yard was used to reduce the rock to loading size. It was loaded out to three 10-yard end-dump Euclids by a Northwest 80-D diesel-powered shovel, and placed on the bottom of the fill sections. Dirt-moving Cobras placed the required 3 feet of cover over the top of the rock.

Hauling conditions on rock excavation were the most miserable of the job. All of the road is on a new location, in the middle of barren desert and lava flows. Dry volcanic soil powdered to the consistency of flour under the Euclid truck tires. Sprinkling would not help much. The drivers ate dust. Bus drivers brought water out from Wendell in 10-gallon cream cans. The men poured water from the can into the top of the lid, gulped it down, and crawled back on their rigs. If the bus driver was ever late with water, they sounded off in no uncertain terms about "that punk!"

Personnel

Morrison-Knudsen's Highway Division is headed by former Army Colonel M. E. Burns, with A. A. Walther as Manager and Percy Prewitt as General Office Manager. On-the-job personnel, in addition to E. Roy Knight, Shull, and Wisnewsky, included two men who were captured by the Japanese on Wake Island and repatriated after the war: Office Manager John V. Polak and Timekeeper Jack D. Taylor. Harry Hensley was the job Master Mechanic.

Completion of this first important contract by M-K's new highway division opens the way for a paving job which will lead ultimately to a much shorter, much needed route between Twin Falls and the northwest.

Mobile Weed Burner

A portable weed-burning unit with several uses is made by the Woolery Machine Co., 2919 Como Ave., S. E., Minneapolis, Minn. It can be used for burning along highway right-of-ways, ditches, canal banks, and in the winter for melting snow, thawing frozen pipes and culverts, and thawing ground for excavating, the manufacturer says.

Pressure atomization of the oil is accomplished by a rotary pump, while the air for combustion is furnished by a steel pressure blower. Both pump and blower are driven by a 3-hp air-cooled engine. The overhead structure carries the burner head and provides the means for adjusting it vertically through an arc of 80 degrees. An automatic friction brake on the hand wheel holds the burner head wherever set for burning or deadheading, according to the manufacturer.

The unit is made in several models. Model A is suitable for mounting on truck, tractor, or trailer. Model B is for mounting on a railroad car only. Model C is built on an angle-steel frame mounted on a two-wheel chassis with either steel or pneumatic tires.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 37.

Using Lincoln shielded-arc equipment, welders splice H-beam piles for a reinforced-concrete pier at Edgewater, N.Y.

Arc Welding Is Used To Splice Pier Piles

The use of arc welding to make pile splices for a heavy reinforced-concrete pier has been described by the contractor, J. Rich Steers, Inc., 17 Battery Place, New York City. The pier was built at Edgewater, N. Y. The crane foundations were designed to support two movable cranes capable of lifting 125 tons at a time. They pick up loaded freight cars from tracks running onto the pier and deposit them aboard a ship.

To support the deck and superstructure of the pier, bents of 13 H-beam steel piles were driven to rock. Later, two batter piles were added to each bent to prevent sidesway.

Plumb piles were used in areas where 214-foot piling was required to reach solid rock. This piling needed three field splices. All splices were butt-welded with shielded-arc equipment supplied by The Lincoln Electric Co.

Plumb piles were set up in the 45-foot frame which handled the piles while they were being welded and driven. The frame was mounted on a 32 x 100-foot deck scow. A McKiernan-Terry 11B3 double-acting steam hammer did the driving while the piling was handled by a steam whirley crane with a 103-foot boom. The entire apparatus was mounted on the deck of the scow.

When a 130-foot section of piling was driven to deck level, another 65-foot length of H-beam was welded to it in the leads. Driving was resumed until the pile was able to bring up on rock bottom. Batter piles (1 on 3 batter) were later driven in a separate set of battered leads. Three welding machines were used to serve three workers who welded simultaneously. In splicing the piling, one welder was able to complete a joint in about 1½ hours.

First-Aid Guide Book

"Standing Orders for the First Aid Worker on Construction Jobs" is a pamphlet issued by the American Mutual Liability Insurance Co., 142 Berkeley St., Boston 16, Mass. It gives instructions to help the first-aid worker determine those cases which may be given local and immediate first aid. It also covers the recognition and proper emergency treatment of a wide variety of injuries.

Qualifications of the first-aid worker are prescribed. And space is devoted to a description of supplies, records, arrangement of first-aid rooms, transportation of injured persons, and emergency procedures.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 74.

New Conveyor Belt Is Strong, Flexible

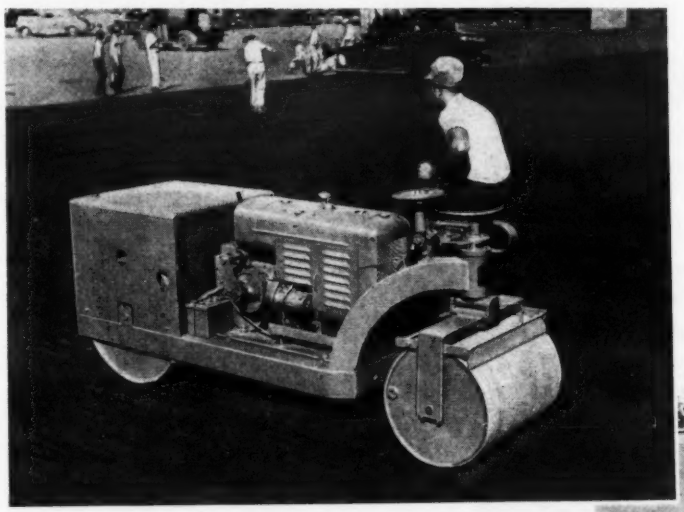
A textile construction of nylon and Ustex yarn has meant greater strength for a new conveyor belt developed by the United States Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y. It is said to be 250 to 400 per cent stronger than previous rubber-fabric belts. Its longitudinal strength is derived from the Ustex, a product of U. S. Rubber; the nylon serves to give the belt crosswise strength.

Conveyor installations of more than 2,600 feet have already been made, requiring continuous belts about a mile long. The manufacturer also states that the belt has been used successfully in lifts as high as 17 per cent grade. The new product is especially designed for use in large dam-construction projects, quarries, gravel plants, etc.

It is said that this new type of construction increases the permissible working tension of each ply 2½ times, and so permits the use of more plies. The number of plies varies according to the service the belt will be required to perform. When brought up to full depth for maximum loads, the belt will still maintain its crosswise flexibility, the manufacturer states. This permits it to curve into the concave idlers and be supported by all three of them, instead of running on the outer idlers without receiving any support at the center. And the material being handled is troughed so that it has little tendency to drop off the belt while in transit.

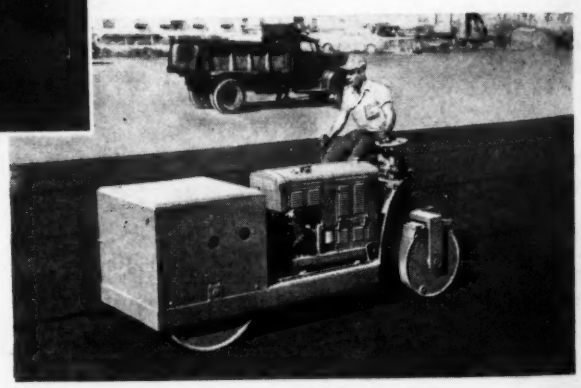
United States Rubber Co. says that the belt can be easily spliced in the field. This aids in the installation of long continuous belts, and speeds up repairs when breaks do occur.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 98.



AT LEFT: A WHEELER TANDEM ROLLER rapidly smoothing out a new "black top" parking area. This Wheeler Roller is equipped with a reliable Allis-Chalmers engine.

BELOW: This pictures another WHEELER TANDEM ROLLER with a sturdy Hercules engine. It handles with equal ease and speed on large areas, confined spaces or for "in close" work.



IMMEDIATE DELIVERY
WHEELER
TANDEM ROLLER

Wheeler is your immediate answer for immediate action on that construction job of yours. Here is a modern designed and constructed roller, which can pare hours off repair and maintenance jobs.

The convenient controls provide quick action, either forward or backward. A few inches movement of the single clutch lever gives positive "non-chatter" movement. This convenient lever provides a quick shift and immediate reversing—taking the machine just the distance it needs to go. Quick turns are provided by convenient steering. Close work is permitted by the high ground and curb clearance and the unobstructed right-hand view. This clear right-hand drive permits fast working close to curbs and obstructions.

Good work is assured by the machine-finished rolls and varying compaction weights. When water loaded, the compaction roller is capable of delivering 150 pounds compression per lineal inch. This also permits a variable weight for the roller from 3 to 4 tons.

SPECIFICATIONS:

DIMENSIONS: Length, 7-ft. 10-inch. Width, 3-ft. 6-in. Height, 3-ft. 11-in.

COMPACTION ROLLER: Width, 36-in. Diameter, 37-in.

STEERING ROLLER: Width, 34-in. Diameter, 27-in.

POWER: 4-cylinder, 27.8 Brake H.P. at 1800 R.P.M., industrial gasoline engine, with 2 forward and 2 reverse speeds. Transmissions: First, 1.5 to 2.5 M.P.H. (forward and reverse). Second, 2.5 to 4 M.P.H. (forward and reverse).

SPRINKLER SYSTEM: Gravity type. Tank Capacity, 45 gallons.

COMPRESSION PER LINEAL INCH: Compaction roller, 150 lbs. with ballast. Steering roller, 70 lbs. with ballast.

ASK A WHEELER ROLLER DEALER FOR COMPLETE INFORMATION

UNITED STATES: NEW YORK: Frantz Tractor Company, New York City; Credle Equipment Company, Utica; Brock Tractor Company, Buffalo; NEW JERSEY: The East Coast Equipment Company, Gar Wood; PENNSYLVANIA: Frantz Equipment Company, Philadelphia, Conte Equipment Corporation, Pittsburgh; MARYLAND: R. S. McCeney Company, Silver Springs; VIRGINIA: Bemiss Equipment Corporation, Richmond and Roanoke; WEST VIRGINIA: Construction Equipment & Supply Co., Wheeling; KENTUCKY: National Equipment Company, Louisville; TENNESSEE: Osborne Equipment Company, Knoxville; MICHIGAN: Eddy & Company, Lansing, and Detroit; MISSOURI: Cooke Tractor Company, St. Louis, Funkhouser Machinery Company, Kansas City; NEW MEXICO: Bud Fisher Company, Albuquerque; ARIZONA: W. P. Powell Machinery Co., Phoenix; UTAH: Cate Equipment Company, Salt Lake City; IDAHO: Southern Idaho Equipment Co., Idaho Falls, MONTANA: Caird Engineering Works, Helena; WASHINGTON: A. H. Cox & Company, Seattle; OREGON: Clyde Equipment Co., Portland; CALIFORNIA: Moore Equipment Company, Stockton, Buran Equipment Company, Oakland, Fresno Equipment Co., Fresno.

CANADA: Rene Talbot, Limited, QUEBEC; Mussens Canada, Limited, MONTREAL; Truck & Tractor Equipment Co., TORONTO, Ontario; Mumford Medland, Ltd., WINNIPEG, Manitoba; Western Tractor & Equipment Co., REGINA, Saskatchewan. Costello Equipment Company, Ltd., CALGARY, Alberta.

NEW DEALERS ARE BEING ADDED—CHOICE TERRITORIES STILL AVAILABLE

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TRANSITS and LEVELS
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We will buy or trade in old Transits, Levels, Alidades, etc. Send instruments for valuation.

Write for new Catalog CE-36 of Engineering Instruments, Engineering Field Equipment and Drafting Room supplies.

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More Improved Roads With Funds Available

Proper Subgrade Preparations Using Local Materials and Undersealing Before Resurfacing Are Economies Suggested by Asphalt Engineer

✦ WHAT we need are not more millions for roads but more roads for the millions we now have available. So stated Bernard E. Gray, General Manager and Chief Engineer of The Asphalt Institute, in his paper on recent developments in asphalt work presented at the recent convention of the Association of Highway Officials of the North Atlantic States. Mr. Gray pointed out that the public is now giving much closer scrutiny to all expenditures of public funds. However desirable various improvements may appear, they will have to be justified on the grounds of necessity and of being able to pay their own way.

It is therefore incumbent upon the highway engineer, Mr. Gray said, to appraise his local resources for road building. He must make the most of every soil and every aggregate available in the area under his jurisdiction, in order to find out what those local materials will do. If he does this thoroughly and carefully, the necessary new highways will be built on selected subgrades of such strength and permanence that the surfacing problem will be relatively simple.

Importance of Subgrades

Mr. Gray emphasized particularly the importance of subgrade strength and stability. During the war years, he said, many valuable lessons were learned about pavement loading. Many highways, formerly restricted as to loading, were suddenly thrown open to unlimited operation. Surfaces thus overstressed promptly showed the effects.

At the same time, airfields were constructed at a rate which in normal times would not have been necessary for at least 20 years. Prior to the war, the heaviest commercial air liner in general use weighed only 25,000 pounds gross, with wheel loads around 12,000 pounds.

Pavements which were adequate for highways had proved quite adequate for this airplane weight. But when heavier loads were applied, new designs and techniques, quite empirical in character, had to be developed to meet the new requirements.

However, it was rather quickly indicated that the critical item in this heavier-pavement design was not the surfacing itself but rather the manner of constructing the foundations.

While the test data have not been completely analyzed as yet, this much is evident: full consolidation of subgrade and base course, coupled with the use of selected soil aggregates in the subgrade, is the real criterion of support value. When this support is achieved, the wearing course needs to be thick enough only to take abrasion and to waterproof the structure below, and to be stable enough to resist the thrust of moving traffic. This required thickness is surprisingly thin, Mr. Gray reported. On the Stockton Test Runway in California, 4 inches of asphaltic concrete on a properly compacted foundation has been adequate for 150,000-pound wheel loadings.

These experiences afford a profound lesson in highway construction. They teach that high support can be secured by building subgrades of substantial thickness with selected soil materials. They teach that where plans can be made well in advance to allow a thorough study of local soil conditions, the materials available within short haul can be used to greater advantage. In the north, under severe winter conditions, a substantial pavement on such a stabilized subgrade is desirable. However, in other areas where climatic conditions are not severe, it is often possible to carry large volumes of traffic on surface treatments alone.

Mr. Gray urged that much greater emphasis be given to subgrade preparation in all future work. "We have talked about drainage and proper subgrade preparation for years," he said, "but only now are we beginning to put talk into practice." We have a real opportunity now in building the interregional system and the new throughways proposed as relief for heavy fast-moving traffic in our densely populated areas. In that work, "nothing could be more permanent or economical than this practice of building high-type subgrades, thereby utilizing the natural inherent strength of selected soils to secure sound foundations."

Even then, he said, "we still shall be pressed to the limit of our commercial production for stone and gravel, not only in the construction of primary highways, but in the vastly extended system of secondary roads that is now contemplated. We need a new concept of what constitutes a pavement. As one engineer recently said, width and other items of design are not matters of type but rather of traffic and what materials are most economical."

"Let's not stare at them, fellows. They're getting embarrassed."

Undersealing for Stability

Another development discussed by Mr. Gray is of particular interest in the problem of maintenance and reconstruction. It is the use of undersealing with asphalt to correct pumping at joints. This involves introducing hot asphalt cement under the joint, (1) to

(*Concluded on next page*)

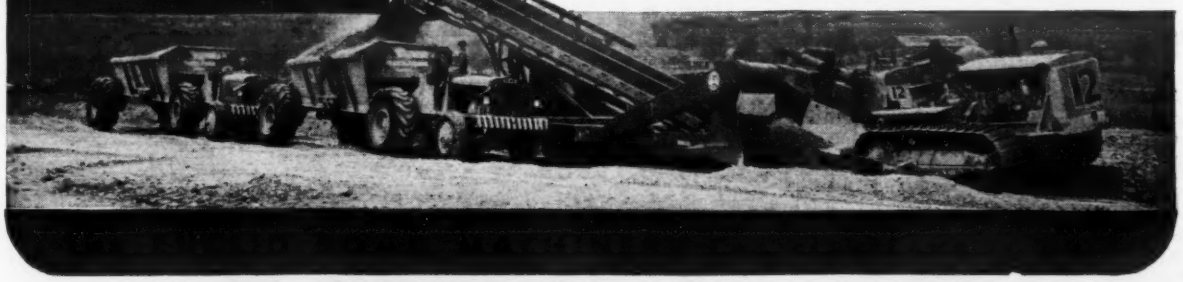
● Construction of the new controlled-access highway between Toronto and Barrie, Ontario, involves moving 7,500,000 cu. yds. of earth. Prominent among the equipment being used on the several contracts are Rear-Dump and Bottom-Dump Euclids.

On one of their contracts Peacock and McQuigge, Ltd. used power shovels for excavation and 15-ton Rear-Dump Euclids for hauling. The Euclids moved clay and gravel from highway cuts for fill at other locations. These contractors also speeded earth moving with a Euclid Loader which delivered 12 bank yds. into Bottom-Dump Euclids in an average of 48 seconds loading time.

On another section Angus & Taylor, Ltd. used 13-yd. Bottom-Dump Euclids, loaded by shovel and elevating grader, to move material on hauls of about one-half mile from cut to fill.

Rear-Dump and Bottom-Dump Euclids combine minimum vehicle weight with maximum strength and capacity. They are built to move pay dirt faster and at lower cost on off-the-highway hauls.

Your Euclid distributor or representative will be glad to provide helpful information for your requirements.



EUCLIDS

STERLING PUMPS

STERLING QUALITY

SIMPLE DEPENDABLE RUGGED

CHOICE OF LEADING CONTRACTORS

WRITE FOR LITERATURE

STERLING MACHINERY CORPORATION
405 Southwest Blvd., Kansas City

More Improved Roads With Funds Available

(Continued from preceding page)

prevent surface water from softening clay subgrades, and (2) to seal the bottom of the pavement against the rise of capillary moisture. In this work it has been found that high-melting-point asphalts give the best results.

Many miles of pavement have been thus treated in a number of states. But Mr. Gray reported that Texas has extended the method on a much greater scale. At present it is the practice in that state to underseal the entire length and area of many pavements prior to resurfacing. This work has furnished some interesting comparisons of the relative economy and effectiveness of total undersealing with a minimum thickness of asphalt surfacing, as opposed to no undersealing and a thicker asphalt surface. Mr. Gray stated that experience is not yet sufficient to permit complete evaluation of the relative costs. But there is no question of the fact that undersealing does stabilize the pavement so that pumping joints are eliminated. Also rocking of broken areas of the slab is prevented so that any movement in the resurfacing is reduced to a minimum, he said.

One of the early difficulties in this type of work was drilling the holes through the pavement. With a single jackhammer, this operation cost approximately 30 cents a hole. But a device for multiple drilling was perfected after experimenters had observed the extent of flow of asphalt under the pavement and had developed the required pattern of drilling.

This device consists of a tractor-and-compressor combination on which is mounted a frame so that three jackhammers can be operated simultaneously or individually by the tractor driver. It has led to such a reduction in cost that recent bids on this work have been as low as 6 cents per hole, Mr. Gray reported. Likewise, the equipment for introducing the asphalt under the pavement has been improved so that the asphalt is kept in constant circulation whether being forced under the pavement or shut off. This has eliminated freezing in the lines as well as loss of time between pouring successive holes.

With these and other developments in methods and equipment, undersealing at the rate of 25,000 gallons per square mile can be done at a cost of a little over 25 cents per square yard. This is somewhat less than the cost of a 1-inch thickness of asphaltic-concrete surfacing. The relative value of one more inch of resurfacing as contrasted with complete undersealing may not always be capable of determination. But, Mr. Gray concluded, it is believed that the possibility of undersealing prior to resurfacing should be investigated thoroughly. In many instances it will lead to stabilized foundations and lower-cost reconstruction.

Perforated-Metal Screens, Plates Listed in Catalog

A catalog describing its line of perforated-metal screens and related products is now available from the Hendrick Mfg. Co., 25 Lewis St., Carbondale, Pa. It gives details on the Hendrick perforated plates for vibrating screens, and illustrates these with drawings and photographs. The screens are available with round openings, square, Squaround, hexagonal, etc.

Also made by the company are testing screens, both hand and motor-driven models. These are described, with photographs, on pages 92 and 93 of the catalog. Other products of interest to contractors and engineers are the Mitco open steel flooring, buckets for conveyors and elevators, and screens for sizing and dewatering.

In addition to illustrating these products, Catalog 46 contains several tables: (1) the relation between screen aperture and size of largest particle in the product produced with various types of screens; (2) percentage of open area in screen plates; (3) weights of various metals; (4) fractions of an inch to decimals, mm to inches, and other equivalents of measure; and (5) area and circumference of circles.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 70.

Welds on Cast Iron

An electrode for machinable welds on cast iron is being distributed by the Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. It is an electrode with a high-nickel core wire and a heavy extruded coating. It is stated that ordinarily this electrode does not require pre-heating.

The manufacturer also reports that the Airco No. 375 will withstand hydrostatic pressure; and that it can be used in downhand, vertical, or overhead positions, or to make multiple-pass welds. It can be used on either ac or dc. It is made at present in 5/32 and 1/8-inch diameters, but the manufacturer plans to add 3/32 and 3/16-inch sizes.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 95.

RUGGED STRENGTH FOR HEAVY HAULING

The m-h "25" Semi

★ 25 Ton Capacity
★ Tandem oscillating axles
★ All Welded Construction
★ Air Brakes

With electric welding throughout . . . sturdy steel construction . . . and careful attention to weight distribution, the M-H "25" is the ready answer to your heavy hauling problems.

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unsurpassed service WITH Yaun

The Yaun Shell type, the all time, all purpose bucket.

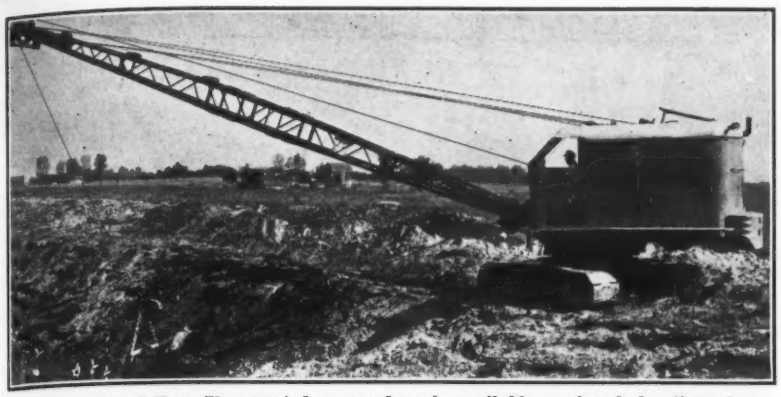
Perforated with the size hole you request, this bucket is "made to order" for you.

Yaun's basket type, for thick wet, hard to handle material

Ask a dragline operator why he prefers a YAUN. He'll tell you in one word—Service. Yaun means service because it does a job better and faster with less costly operator fatigue. Every trip with a Yaun carries a full load. Precision built, all parts are of manganese steel. Ask the man who uses a Yaun. He'll tell you.

Details and Prices obtainable from dealers or direct from

YAUN DRAGLINE BUCKETS AND MFG. PLANT
BATON ROUGE, LA.



The new Osgood Type 71, mounted on crawlers, is available as shovel, dragline, clamshell, backhoe, crane, and other combinations. It also comes as a wheel-mounted unit known as the Model 715 Mobilcrane.

Crane Unit Mounted On Crawler or Wheels

A 1¼-yard machine has been added to the line of the Osgood Co., Marion, Ohio. The Type 71 is made in either crawler or wheel-mounted models. Model 710, mounted on crawlers, is available as shovel, dragline, clamshell, crane, backhoe, and other combinations.

Power is carried from the gasoline or diesel engine or electric motor to the reversing shaft by roller chain, drip-lubricated and fully enclosed. The drum shaft carries two cast-steel skeleton-type drums; on these are bolted the two-piece interchangeable drum laggings and the two-piece crowd sprocket for shovel service. A swing brake, operated by air, is mounted on the horizontal reversing shaft. An automatic swing lock is engaged when the swing clutch is disengaged.

On the Model 710, the clutches for traveling and steering are operated by air. The machine can be steered without stopping its forward motion, and with the cab in any position over the trucks.

The standard boom-hoist unit is also operated by air. Final drive is by worm and worm wheel for safety. Other safety features claimed by the manufacturer include an automatic brake band on the worm shaft, and a pawl for positive locking of the boom. An independent boom-hoist unit may be provided, which is powered from the hoisting gear and controlled by two Twin Disc clutches.

The deck is a unit-steel casting, with the cast-iron safety fuel tank and the counterweight resting on projections at the rear. Operating machinery and side frames are mounted on machined pads. The crawler-truck frame is a heavy deep-section unit-steel casting. Truck side frames are carried down low to the treads to exclude foreign matter from the tread belts. A digging lock is mounted on the shaft to prevent movement of the machine while digging.

The all-steel shovel boom is of the electrically welded box type, with an extra-wide boom foot. The bucket has bail, renewable front, and reversible teeth. The shipper shaft is placed 6 inches above the center of the boom for greater digging radius. The crane boom is of the box type, of high-strength steel electrically welded, with tubular lattice. Fairlead for dragline service is of the swinging type, with sheaves mounted on roller bearings.

The standard Model 715 Mobilcrane has 12 pneumatic-tired wheels. It is one-man-operated and self-propelled. Four speeds up to 5 mph are available. Gears are shifted by air and manually controlled in the transmission of the chassis. The rear wheels are arranged to oscillate, and the front axle is carried in a pivot, giving three-point suspension.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 33.

Road Spreader Fits Dump-Truck Tail-Gate

A spreader which attaches to the tail-gate of a dump truck is made by the Tonawanda Engineering Co., Tonawanda, N. Y. It is designed to spread sand, gravel, cinders, chips, crushed stone, and similar materials on highways and streets.

The Teco spreader can distribute a load over its entire width of 10 feet. Or this can be reduced by dropping 12 or 15-inch plates located next to each other along the inside of the spreader. Thickness of spread is regulated by an operating handle on the driver's side of the truck. The size of opening can be varied from 5 inches on down. Baffle plates on the inside of the spreader are said to insure even distribution of material coming from the dump truck.

A platform has been installed on one side of the Teco to enable the operator to ride along with the truck, signal the driver, and control the flow of material. The spreader is attached to the truck by means of hooks placed on the tail-gate. Approximate weight of the unit is 800 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 79.

Minton Named by Koppers

Brigadier General Hugh C. Minton has been named Production Manager of Koppers Co., Inc., of Pittsburgh. In his new position, General Minton will report to General Brehon Somervell, President of the company, with whom he was associated during the war.

LANSING

WHEELBARROWS

CONCRETE MIXERS

DRAG SCRAPERS

Lansing Company
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SINCE 1861

TRANSALL TILTOLOAD

A NEW LOW-BED LOW-COST

TILT TRAILER

The New
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TILTOLOAD
TRAILER

25 TONS
CAPACITY

LOADING D-8 TRACTOR

IMMEDIATE DELIVERY

D-8 TRACTOR LOADED IN THREE MINUTES

The TRANSALL TILTOLOAD TRAILER features a Low-Tilt Bed that can be completely handled by one man.

- ★ TRANSALL TILTOLOAD TRAILER is perfectly balanced, requiring no jack at tongue of trailer
- ★ Can be coupled, loaded and driven by one man
- ★ No skids or ramps required
- ★ TILT DECK is hydraulically raised and lowered by weight of load either forward or backward

LOADING 3-WHEEL ROLLER

WRITE FOR COMPLETE INFORMATION TODAY

WRIGHT TRAILER COMPANY

117 EAST COLORADO ST. — *Manufacturers of Commercial Trailers* — PASADENA 1, CALIF.

Telephone Sycamore 6-8726

Truck-Mixers Haul Concrete for Paving

Chute It Onto Subgrade Where Spreader Levels It; Spade-Type Expansion Joints Used Every 89 Feet

(Photo on page 1)

✦ A 2.11-MILE stretch of 24-foot concrete pavement was completed in Westchester County, N. Y., last autumn. Eventually it will serve as an outlet for the Sawmill River Parkway Extension, which is now being designed for completion from Chappaqua to Katonah in order to afford a direct through route from New York City.

To take care of the traffic from this Parkway, the State Department of Public Works agreed before the war with Charles H. Sells, then Commissioner of Public Works of Westchester County, that Route 22 would be rebuilt. It would be reconstructed on better alignment with four traffic lanes northward to a connection with Route 6 at Brewster. The current contract is the first step in this plan.

This section is entirely on new location. It lies about ¾ mile west of the original Route 22, which is distinguished by what is known as "snake-track alignment". Some time in the future, another 24-foot pavement will be added on the east side of the present construction, separated from it by a 20-foot dividing mall. And while this will be a state highway open to commercial traffic, it is planned to carry out as far as is practicable the type of construction and safety standards incorporated in the Parkway south of Katonah.

This newly completed pavement of 9-inch reinforced concrete in two 12-foot lanes will be the southbound lane in the completed development. Now it is serving as an alternate to Route 22 in the towns of Bedford and Lewisboro, beginning on the east bank of Muscoot Reservoir just across from Katonah, and continuing north to Goldens Bridge where it joins original Route 22.

A contract for the project was awarded to the Grandview Co. of Mount Vernon, N. Y., on its low bid of $173,559.40 by the New York State Department of Public Works. Grading started on May 21, 1946, and by August paving was under way. The concrete pavement was completed September 23; the macadam pavement and intersections were completed November 5; and the entire job was finished on November 21. The contract completion date was December 30.

Concrete for the paving was purchased from a commercial central batch plant located at near-by Bedford Village. It was hauled to the job site in nine truck-mixers and poured on the prepared subgrade. There it was spread and finished by machines with the employment of a minimum of hand labor.

Grading

Actually this highway project started five years ago when the new location was graded by another contractor from Poughkeepsie, N. Y. But the war intervened before the paving could be started, and the project was postponed. This gave the 20 to 30-foot fills a chance to settle. In some locations they did

(Continued on next page)

C. & E. M. Photo

A Jaeger-Lakewood two-screed finishing machine levels off 2½ inches of concrete which truck-mixers have chuted on top of steel-mesh reinforcement. This operation brings the slab on New York's Route 22 to its final 9-inch depth.

Bertha didn't understand parade work... so they fixed her with Crosby Clips!

For the long pull, there's one best wire rope fastener . . . CROSBY CLIPS. Safe, simple, speedy; applied anywhere by one man with one wrench. *Drop-forged*, not cast. Hot dip galvanized for longer life. Distributors everywhere. Made only by AMERICAN HOIST and Derrick Co., St. Paul, Minnesota.

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than all other drop-forged fasteners

Compact design, with weight properly distributed for a low center of gravity, gives the Bucyrus-Erie ⅜- to 2½-cu. yd. excavators their unusual stability . . . and provides the safe, sure working foundation you need for efficient, high-speed dragline operation. Long, widespread mountings and treads with large bearing areas are other factors giving the Bucyrus-Eries a sure-footedness ordinarily expected only from heavier machines. And there are other features, too, which combine to deliver high output with Bucyrus-Erie draglines—the positive, full-feel control and slow speed, smoothly responding clutches and brakes which give the operator secure command of the load throughout the cycle; the all-welded, latticed box section boom that resists swing and compression stresses, and the strong, balanced Red Arch buckets that fill easily, carry smoothly, dump cleanly. For long hours of sustained production that result in bigger profits, you can't beat a Bucyrus-Erie. Let your distributor show you more reasons why they are such outstanding performers. 93E47

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY

SOUTH MILWAUKEE, WISCONSIN

C. & E. M. Photo
A joint setter smooths over the subgrade with a shovel on the Grandview Co. job, after securing the Acme spade-type joints in place between the Blaw-Knox forms with form pins.

Truck-Mixers Haul Concrete for Paving

(Continued from preceding page)

so as much as 12 to 18 inches.

But the discrepancy was rectified in this contract, for the entire roadbed was rough-graded to within 6 inches of finished surface, either cut or fill. Engaged in the work was a LeTourneau 12 to 15-yard scraper pulled by a Caterpillar D8 tractor, which averaged 600 to 700-foot hauls. A 12 to 15-yard Tournapull was used for the longer hauls up to 1,500 feet. A Caterpillar power grader then shaped the roadway.

On top of the new grade a foundation course of run-of-bank gravel was laid to a depth of 8 inches to support the concrete pavement. The bank-run gravel was required to pass a 4-inch square sieve, and was obtained from a pit near the south end of the job. A Northwest 2-yard shovel handled excavation and loaded three 14-yard bottom-dump and two 10-yard end-dump Euclids for the 1-mile-average haul. The power grader bladed the gravel to shape, and it was compacted by a Huber 3-wheel 10-ton roller.

The 24-foot concrete pavement has a straight crown of 3/16 inch per foot. On either side are 8-foot shoulders which slope at the rate of an inch per foot. Both cut and fill backslopes are 1 on 1¾. When the subgrade was ready, the state engineers set steel pins to the proper alignment and grade. Then the Blaw-Knox forms, of which there were from 3,000 to 4,000 feet on the job, were set by a crew of four.

The grade between the forms was then checked by a Cleveland scratch template equipped with 23 pins, which was pulled along on wheels two on a side. The roller compacted any irregularities in the gravel base course, and another similar scratch template with 42 nails was then pulled over the grade as a final check. The entire west 12-foot lane was poured first from south to north. It was followed by the adjoining lane, proceeding the same way.

Expansion Joints

Transverse contraction joints were employed in the pavement. Every 89 feet 4 inches, an expansion joint was set across the 9-inch slabs. Acme spade-type joints with Flexcell bituminous fibre expansion material were furnished by the Thompson Materials Corp. of New York City. A joint setter secured these in place with 7 form pins, 3 on the side facing the pouring operations, and the remainder at the back of the joint.

The "spades" which give the joint its name rest in 7 pairs on 14½-inch centers across the 12-foot lanes. The first pair is 6¾ inches off the edge of the form. The "spade" parts of the joint go under the expansion material and move within a slot or box to satisfy conditions of expansion or contraction. They connect with 1-inch rods which project 6 inches into the concrete on a plane 4 inches above the bottom of the slab.

The fiber joints are cut full width, but they are ½ inch shy of the slab depth so that the joint cracks can later be poured with bitumen. Although the fiber is recessed, the joint is kept flush with the top of the forms by means of a metal channel with 1½-inch lips on both sides and ¾ inch in width. The finishers removed this cap after the concrete had its initial set. Notches were cut in the fiber so that the joint supports have clearance.

After the joint setter had driven the last supporting pin, he smoothed over the subgrade with a shovel. Then he gave the area around the joint a final rolling with a Dunham water-weight 200-pound roller-bearing hand roller. The forms were given a light coating of oil and the grade was wet down with a hose. Water was brought to the job from hydrants in Katonah in a 700-gallon tank mounted on an International truck. No pump was necessary to fill the tank, but a Decatur 2-inch pump added pressure to the gravity flow from the discharge hose.

Concreting Operations

Concrete was purchased from a commercial plant at Bedford Village, and delivery was made by the seller in a fleet of 9 truck-mixers after an average 6-mile haul. The fleet was composed of three Jaeger 7½-yard mixers owned by the seller, and six Rex 5-yard units rented from Cooney Bros., Inc., of Tarrytown, N. Y. All truck-mixers were mounted on Macks. While the cement, sand, and stone were admitted to the drums at the plant, no water was added until the job was reached. And

(Continued on next page)

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Asphalt and Tar Kettles
Portable Hoists
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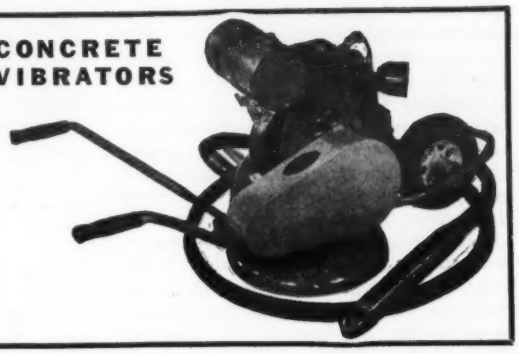
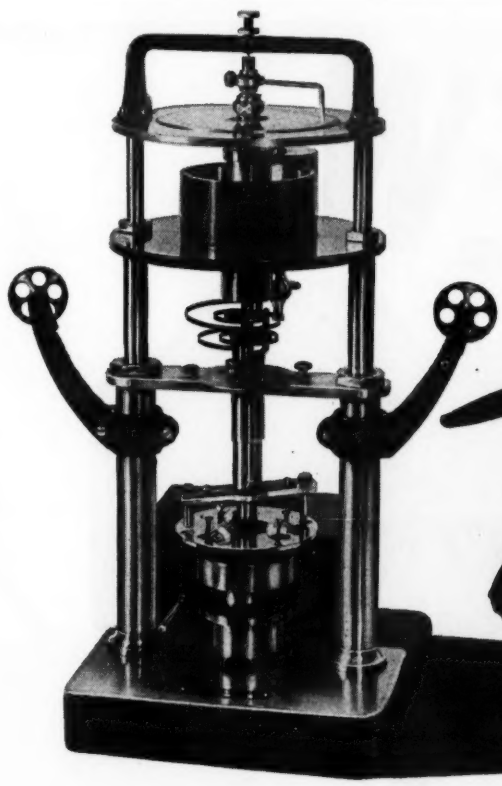
CHICAGO 4, ILLINOIS

CONCRETE VIBRATORS





GOVERNOR OF Friction

(Herschel Coefficient of Friction)

As power is the life blood of industry, friction is the deadly poison that can slow wheels, reduce efficiency to the point of disaster.

Correct lubrication, obviously, is the preventive which protects power against the depredations of friction. And . . . the coefficient of friction of a lubricating oil is an important factor in the utilization of input power in all machines.

Sinclair Research is ever alert to aid you in developing maximum output from your equipment with such apparatus as the Herschel Coefficient of Friction machine, shown above. This machine is invaluable where lubrication of all parts of machinery is concerned.

With such apparatus and the continuous effort of skilled experts in refinery control, Sinclair assures you of outstanding performance from lubricants developed specially for your specific application.

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FOR MINIMUM FRICTION—MAXIMUM POWER
OPALINE MOTOR OIL
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Lubricants for Industry
FINEST CRUDES + EXPERT RESEARCH and MANUFACTURING CONTROL = OUTSTANDING PERFORMANCE

Truck-Mixers Haul Concrete for Paving

(*Continued from preceding page*)

then the batch was mixed for 10 minutes before it was discharged down chutes onto the subgrade.

The typical mix was a 7-bag batch in the proportions 1 : 1.75 : 3.5 which yielded 1.08 cubic yards of concrete. For every 6 bags of portland cement (either Penn Dixie or Lehigh was used) a bag of Century Cement Mfg. Co.'s natural cement was added. This was done to supply a denser mix and better workability through retarded setting of concrete, and to check possible scaling in the future. An average of 4 to 5 gallons of water was required for each bag of cement. But actually in a 7-bag batch only about 28 gallons were added, as the moisture content of the aggregate accounted for the remaining 7 gallons. The weights of a typical 7-bag batch were as follows:

Natural cement	80 lbs.
Portland cement	564 lbs.
Sand	1,396 lbs.
Stone	2,289 lbs.
Water	35 gals.

In the coarse aggregate the stone was made up of a mixture of 55 per cent No. 3A stone and 45 per cent No. 1 and No. 2 stone. The gradation of both fine and coarse aggregate is as follows:

	Per Cent Passing			
Sieve Size	Sand	No. 1 Stone	No. 2 Stone	No. 3A Stone
2½-inch	....	....	....	100
1½-inch	....	....	100	90-100
1-inch	....	100	90-100	0-15
½-inch	....	90-100	0-15	....
¼-inch	100	0-15	....	....
No. 4	90-100	....	....	....
No. 14	55-75	....	....	....
No. 48	10-25	....	....	....
No. 100	2-8	....	....	....

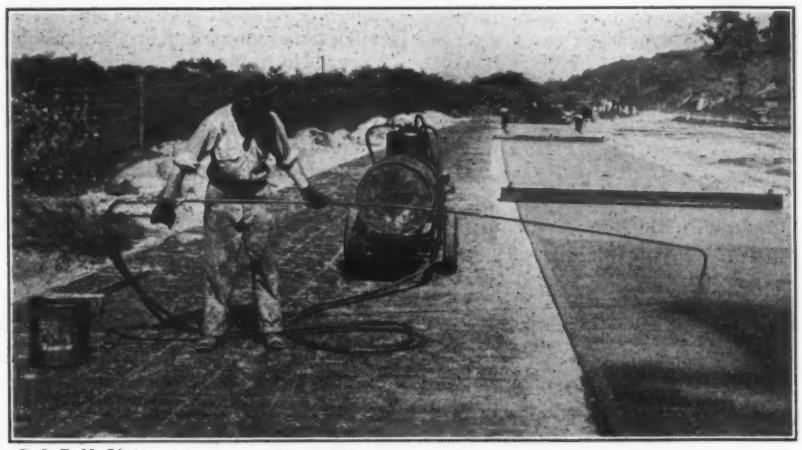
The truck-mixers unloaded either from the grade alongside the forms or from the lane that had been poured first. When the entire fleet was available, the usual procedure was to discharge along the full length of a slab within expansion joints. The concrete was then leveled to a 6½-inch depth by a Jaeger spreader with a worm gear, which traveled back and forth between the forms. With this machine the old back-breaking job of puddling the concrete was reduced to a minimum. While a couple of men were required to direct the flow of concrete down the chutes of the truck-mixers, their puddling activities were confined to seeing that the mix did not flow over the forms or spill on the adjacent slab. The spreader with a single operator replaced the bull work required of a gang of puddlers.

The concrete was leveled off 2½ inches below the top of the slab to permit the placing of Wickwire Spencer Steel Co. mesh reinforcement which was handled by two other men. The longitudinal members of the mat are ⅜-inch rods, while the transverse steel members are ¼-inch rods. The sides of the slabs were spaded, and a Jackson vibrator carried on the spreader vibrated the concrete around the joints.

After the steel mesh was laid on the concrete, the truck-mixers followed behind the spreader chuting more material until the forms were filled. A Jaeger-Lakewood double-screed finisher then passed over the surface between joints leveling off the concrete just added by using its front screed only. Then the machine was backed up and sent forward again to repeat the process, this time using both screeds.

Finishing Methods

Unable to buy the necessary replacement parts for his mechanical longitudinal finisher, the contractor resorted to a bull finisher or wooden screed, triangular in cross section and 18 feet long. This extra length enabled the two screed men to work the device at a 45-degree angle across the pavement, since the slabs are only 12 feet wide. By advancing the screed in this position it was felt that if any slight irregularities should remain in the surface of the concrete, no two wheels of a passing car would strike a bump or depression at the same time.



C. & E. M. Photo

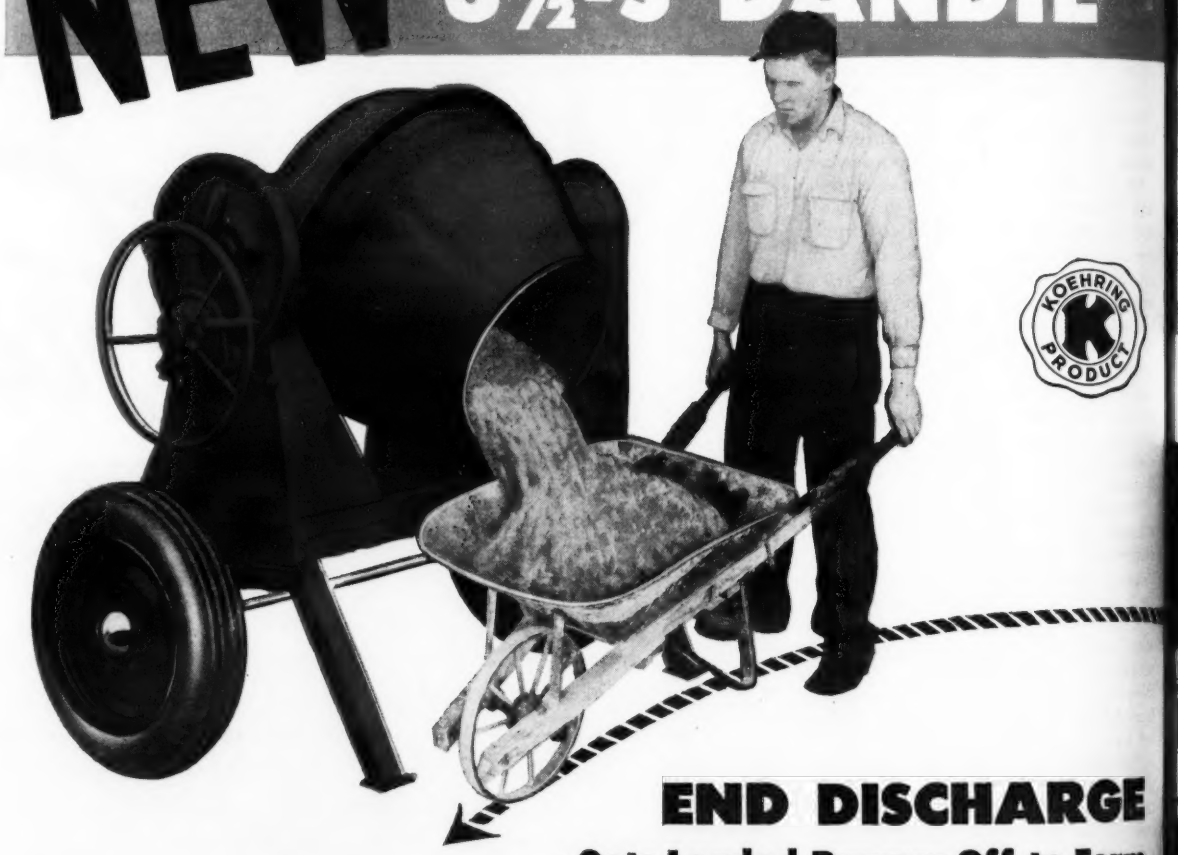
A Grandview Co. worker applies Hunt Process curing compound through a 12-foot spray bar at 0.1 gallon to the square yard. The 2-wheel portable unit behind him carries the compound; a Briggs & Stratton engine furnishes power for the spraying.

A wooden belt made of a length of 1 x 12-inch stock was then pulled over the concrete, floating the full slab width in one operation. To this float a piece of burlap was nailed. It extended the width of the lane and 6 additional inches on each side to be certain of an overlap, and reached out for a length of 3 feet. The burlap was pulled over the surface removing any moisture that might have worked to the top of the slab. After this operation two finishers edged along the forms and joints in a preliminary move to dislodge any pieces of aggregate that needed cutting out. A wooden bridge gave the men access to the center of the slab along the joints.

The surface was checked with a 10-foot long-handled straight-edge, and any irregularities over ¼ inch were floated out. But this was seldom necessary with the machine finishing. When the water had entirely disappeared from the surface the concrete was roughened with a wire broom. This was done when the concrete had attained a slight set on top so that the broom marks would not be quickly lost and would

(*Concluded on next page, Col. 4*)

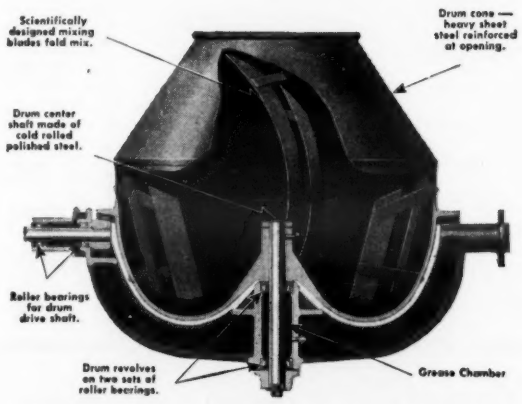
NEW KWIK-MIX 3½-S DANDIE



END DISCHARGE

Gets Loaded Barrow Off to Form Fast and Easy with ½ the Effort

Backing and turning loaded wheelbarrow away from mixer is tough on back and arm muscles, slows down the crew sooner or later. End discharge feature of the new Kwik-Mix 3½-S Dandie concrete mixer eliminates need for backing and turning loaded wheelbarrow. Because end discharge permits free approach from all angles, you turn before you approach mixer, then spot barrow sideways to mixer, facing toward form. When wheelbarrow is loaded, you pick up and go. No backing, no turning. You save time and ½ the usual effort, eliminate end-of-shift fatigue, get more concrete hauled every shift.


Scientifically designed mixing blades fold mix.
Drum cone — heavy sheet steel reinforced at opening.
Drum center shaft made of cold rolled polished steel.
Roller bearings for drum drive shaft.
Drum revolves on two sets of roller bearings.
Grease Chamber

Inside the Dandie drum, two long and two short mixing blades fold cement and aggregates. Husky drum bowl is securely cradled in high strength yoke. Roller bearings assure smooth running.

KWIK-MIX COMPANY

KOEHRING SUBSIDIARY • PORT WASHINGTON, WISCONSIN

Paving Breaker Does Heavy, General Work

An 82-pound machine for general paving breaking and heavy-duty demolition is one of the latest construction tools produced by Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

Features claimed for the new PB-8 are: a kicker-port valve said to increase the efficiency and striking power of the machine; a metering device for regulating flow of lubricants to all working parts; a large-size oil reservoir in the handle; a rigid joint between the handle and cylinder due to 4-bolt construction; reverse buttress threads on the front-head bolts to provide sufficient tightness without over-stressing the bolts; and a new throttle valve said to allow a gradual entrance of air and thereby make possible easier and smoother starting.

Design of the new breaker includes a sturdy block-type piston, long anvil-block bearing, and a longer handle. The anvil-block bearing assures correct alignment between the cylinder and fronthead, says the manufacturer. The longer handle provides a larger gripper surface to reduce operator fatigue.

The paving breaker may be converted into a pile driver or spike driver by changing frontheads.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 4.

C. & E. M. Photo

Joints were poured with tar about a month after the concrete pavement near Katonah, N. Y., was finished. And on the curve shown here, small stones were placed in the joints on top of the tar to keep it from running over. A Littleford portable kettle towed by a Mack truck heated the tar.

Truck-Mixers Haul Concrete for Paving

(Continued from preceding page)

provide good traction.

The joints and sides along the forms were then edged a second time with a ½-inch-radius tool. By this time the concrete had set enough so that the finishers could remove the metal caps or channels from the joints leaving the top depressed ½ inch below the surface.

The concrete was cured immediately after brooming by sealing in the moisture with the Hunt Process applied through a 12-foot spray bar at the rate of 0.1 gallon to the square yard. The curing compound was carried around on a 2-wheel portable unit assembled by the Thompson Materials Corp. and powered by a Briggs & Stratton gasoline engine. A small pressure tank was used to spray the compound on the sides of the slabs.

The forms were removed after 24 hours and moved ahead. The concrete was cured sufficiently to permit traffic in 7 days. However, the road was entirely on new location with no pressing need for its use, so the slabs were not opened for a 12 or 14-day period.

About a month after the concrete was laid the joints were swept out with hand brooms. Also, the ½-inch-deep transverse joints and the longitudinal butt joints were poured with tar which had been heated in a Littleford portable kettle by a kerosene burner. The unit was towed around by a Mack truck. On superelevated curves, small stones were placed in the joints on top of the tar to prevent it from running over on the concrete pavement. As the tar hardened and set, they were picked out.

Quantities and Personnel

The major items in this 2.11-mile highway contract included:

Excavation	20,000 cu. yds.
Steel-mesh reinforcement	26,080 sq. yds.—pvt.
Gravel foundation course	4,000 cu. yds.
Concrete pavement	6,520 cu. yds.
R. C. pipe, 18 and 24-inch	1,290 lin. ft.

An average force of 25 was employed by the Grandview Co. under the general supervision of Dominic Mirabelli, one of the three brother members of the firm, with C. Cronquist as Engineer. The contractor's personnel consisted of 6 administrative employees, including an engineer, a timekeeper, 3 foremen, and an inspector for the Village who was on the contractor's payroll (a portion of the construction was located on municipally owned land and a local ordinance required the contractor to hire an inspector); 5 skilled workers including 2 mechanics, 2 finishers, and 1 carpenter; 8 intermediate workers including 3 operators for the roller, spreader, and finishing machine, 3 form setters, and 2 truck drivers; and 6 unskilled laborers working at the rate of $1.15 per hour.

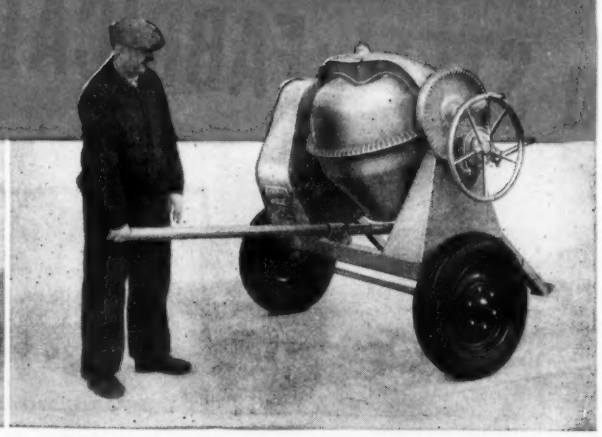
The best concrete production over an 8-hour day was 268 yards, when 9 panels or 804 linear feet of 12-foot concrete 9 inches thick was poured. Because of the difficulty of always getting the desired number of truck-mixers, this production figure could not be increased.

For the New York State Department of Public Works, S. G. Sarkissian was Engineer in charge assisted by William Sedgwick. The project is located in the Eighth District which is headed by James S. Bixby, District Engineer, with headquarters at Poughkeepsie. Charles H. Sells is Superintendent of the Department.

Marquette Cement Moves

Transfer to new and larger quarters has been announced by the Marquette Cement Mfg. Co. Its general offices are now located at 20 No. Wacker Drive, Chicago 6, Ill.

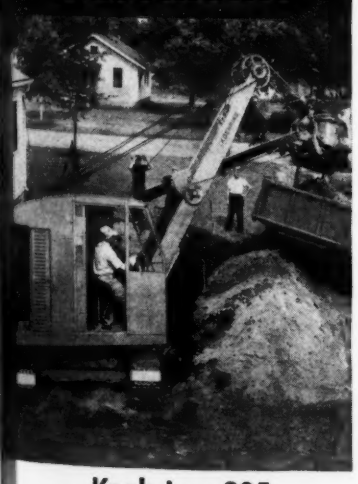
EASIER SPOTTING No Tip-overs with New *PUSH-DOWN* Tow Pole



To move the new Kwik-Mix Dandie End Tilter, tow pole is pushed down, not up. You use your weight, not your muscle. Every time you move the 3½-S Dandie or hitch it to the truck, you benefit from this exclusive feature.

Because you push tow pole down, not up, this mixer just can't tip over. When you release tow pole, mixer always lands on legs. When you push too far, tow pole hits ground before mixer can go off balance.

Heavy-Duty Means More Basements

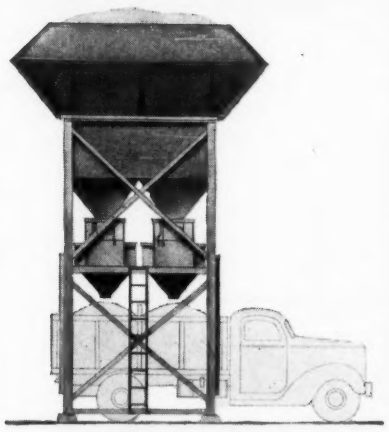


Koehring 205 Half-Yard Shovel

These features produce more basement every shift: All main shafts run on anti-frictions . . . trigger fast dipper trip works positively, every time, in just ½ second. Square corners, walls straight, tight to stake lines easy, because clutches and brakes respond instantly, smoothly.

KOEHRING COMPANY MILWAUKEE 10 WISCONSIN

1-Stop Loading for 2-Batch Trucks

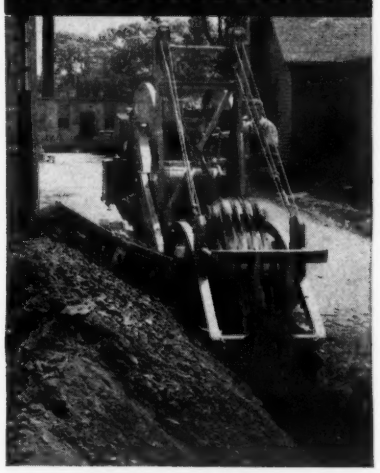


Johnson Dual Aggregate Batch Plant

With the Johnson Dual Aggregate Batching Plant, you spot batch trucks just once for a two-batch load. Both batches are discharged simultaneously. Extra spot stops are eliminated. On most jobs, number of hauling units can be materially reduced.

C. S. JOHNSON COMPANY CHAMPAIGN, ILLINOIS

Husky Wheel is Pivot-Mounted



Parsons 200 Wheel Trenchliner

Latest addition to the Parsons line. Built for mile-a-day pipeline work, farm and railroad drainage. Pivot-mounting of wheel simplifies fine grading of trench bottom. Improved wheel support. Two dollies at wheel bottom. Gears fully enclosed in oil tight case.

PARSONS COMPANY NEWTON, IOWA

Need to Relight U. S. For Highway Safety

We need at least a doubling of the national average $1 per capita expenditure for highway and street lighting, Dr. A. F. Dickerson, Manager of the General Electric's Lighting Division, told members of the Southeastern Electrical Exchange recently. He said that ten years and 50,000 miles of traffic and residential-street lighting are required to relight America. Cost of lighting this 50,000 miles of streets and highways was estimated by Dr. Dickerson at $500,000,000.

Less than 2 per cent of the municipal tax dollar now goes for street lighting, he stated. Citing the case of New Jersey, he indicated that state aid may be the solution to the problem. The State of New Jersey pays the private utility companies for a 2,500-lumen lamp in a modern luminaire for each 200 feet of state-designated highway within the corporate limits of towns, villages, and cities. More light than this is usually used and the excess cost is borne by the local community. The State wholly finances large quantities of continuous highway and intersection lighting outside of urban limits.

It was pointed out that the new edition of the Illuminating Engineering Society's "Recommended Practice of Street Lighting" is becoming the accepted standard of street-lighting practice in most of our cities. In the IES Code, pendant luminaires are specified exclusively because they provide from two to three times as much light on the pavement as the commonly used upright globes and lanterns.

Dealers Added by Shaw

The following distributors have been added to the sales organization of Shaw Sales & Service Co., Los Angeles, Calif.: The Bemiss Equipment Corp., Richmond, Va.; Brock Tractor Co., Buffalo, N. Y.; Carr Equipment Co., Columbus, Ohio; Eddy & Co., Lansing, Mich.; Interstate Equipment Co., Statesville, N. C.; National Equipment Co., Louisville, Ky.; and The Hutchinson Foundry & Steel Co., Hutchinson, Kans.

These dealers will handle the Wheeler 3 to 4-ton roller, large shipments of which have recently been made from the Shaw plant in Los Angeles.

Conveying, Loading Units

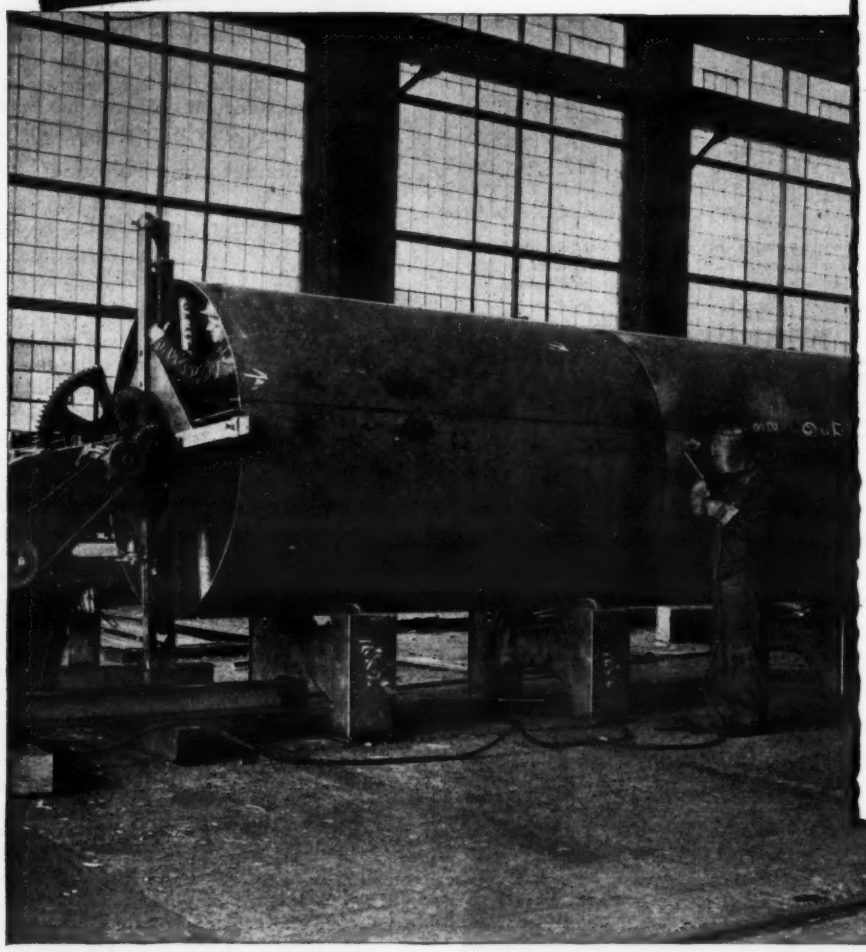
A catalog which shows its line of conveying and loading equipment can be obtained from the Atlas Conveyor Co., 1st and 15th Sts., Clintonville, Wis. It contains photographs and specifications of all units in the Atlas line.

These units include portable belt and flight conveyors and bucket elevators for handling sand, gravel, and abrasive or non-abrasive materials. The catalog devotes a complete section to the Atlas line of idlers, showing construction details and the sizes in which they are manufactured.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 22.

"FEDERAL" experience pays off . . .

in STEEL FABRICATION



STACKS, BREECHINGS
BOILER CASINGS
★
SPECIAL TANKS
★
DREDGES, DREDGE PARTS
★
HEAVY BENT PLATE FABRICATION
★
STEEL METAL PRODUCTS
★
KITCHEN AND MARINE GALLEY CONSTRUCTION
★
HEAVY MACHINE CONSTRUCTION
★
FLOATING STRUCTURES AND CAISSONS
★
FLOAT BRIDGES
★
HEAVY FABRICATED ASSEMBLIES FOR EXPORT
★
SPECIAL STRUCTURAL STEEL

Let "Federal" experience . . . long famed in shipbuilding and ship repairs . . . work for you in another important field: *miscellaneous steel fabrication*.

Specialized steel construction has been a leading "Federal" activity for years. Our wide experience, gained through hundreds of varied jobs, is your assurance of complete and speedy satisfaction.

FEDERAL SHIPBUILDING AND DRY DOCK COMPANY
LINCOLN HIGHWAY · KEARNY, NEW JERSEY
UNITED STATES STEEL

Why CHIP Slag when you can BRUSH IT AWAY!

NEW EXTRUSION COATING improves weldability of COATED STOODY* SELF-HARDENING!

*For resisting impact and abrasion on earth-working equipment.

Those clean, bright beads of Coated STOODY SELF-HARDENING are ready for a second deposit without tedious chipping with a hammer. For this improved extruded coating forms a slag that readily loosens from the weld as deposits cool. Simply *BRUSH* it away and you're ready for the next deposit! And here are other improvements:

THE NEW EXTRUSION COATED STOODY SELF-HARDENING

- Is easier to apply.
- Retains same hardness and wear resistance of former alloy.
- Has higher deposition rate.
- Can be applied with either AC or DC machines.
- Possesses wide amperage latitude in welding.
- Is completely uniform.
- Is free from moisture absorption.

Order 50 lbs. today! You'll enjoy greater ease and speed in welding—and are assured of the time-proven wear protection of the former alloy. Available in 3/16", 1/4", 5/32", and 1/8" rods. No change in price. Over 600 U.S. Dealers.

HOW TO GET THE MOST FROM HARDFACING: *Ask for free copy of the new STOODY GUIDE BOOK . . . illustrates 125 proven applications for increasing equipment life!*

STOODY COMPANY
1136 W. SLAUSON AVE., WHITTIER, CALIF.

STOODY HARD-FACING ALLOYS
Retard Wear · Save Repair

Buy U.S. Savings Bonds REGULARLY

Ask where you WORK
Ask where you BANK

Good Gravel Roads On $50,000 Budget

Western Ranch County Dresses Gravel Roads Every 12 or 15 Days To Keep Them Smooth

✦ A 12-INCH gravel windrow about 10 inches high, which is bladed from side to side on 500 miles of 26-foot road every 12 or 15 days, is the secret of low-cost maintenance in Graham County, Ariz. With an annual budget of only $50,000, the County Road Department is successfully maintaining smooth all-weather roads with very little equipment and only twelve men.

Ordinarily the summers are extremely dry in Graham County. Roads made of native granular earth and gravel set up as hard as concrete, with little dust. The secret in maintaining this type of road, according to Road Foreman D. W. Colvin, is to reach down into the ditches in the spring when the ground is damp, and bring up enough material on a motor-grader blade to drift over the full width of highway. A small windrow then is left on the slope break at each shoulder line.

At regular intervals—and that is important—this windrow is drifted across the road to the far shoulder with a good motor grader. The larger particles that have worked up to the surface are swept aside, and finer material is left to fill the voids. Any washboarding is cut away. The result is a smooth, fast road quite ample to handle the light ranch traffic using it.

Graham County, in the southern part of the state, is one of Arizona's large but sparsely settled regions. Its people contribute about $30,000 in road taxes each year, and the remainder comes from the state gas and registration fees as fixed by law. It is not much. An $800 repair bill to one of the three county tractors is a major calamity, so far as the budget is concerned. Nowhere in the United States do public officials make greater effort to put as much of each dollar back into the roads as here.

Variety of Roads

Graham County is mountainous, with high plains that are reasonably flat. Above Coolidge Dam on the Gila River is a strip of fertile farmland, irrigated for crop production. For the most part the county's vast acreage is divided into ranches. In addition to the 300 admitted miles of county roads, the machines maintain some 200 miles of access to ranches.

There are only 15 miles of oil-cake surface in the county system, but the board of three supervisors has planned to construct a few miles of bituminous roads each year in the future, as funds permit. The Federal-Aid secondary-road program will also help Graham County to some extent. Several projects under that system have now reached the plans stage.

County roads are built of native earth, either graded in place or hauled a minimum distance. Several borrow pits are situated strategically over the county, and machines can be moved wherever they are needed.

Equipment includes nine dump trucks, a Plymouth pick-up, a Cedarapids 2 x 8 crushing plant, a Bay City Model 25 shovel with a ½-yard dipper, a Hough front-end loader on an International tractor, an International TD-18 and a TD-40 with dozer blades, and a 20-ton low-bed trailer. Motor graders include a Caterpillar No. 12, an Adams 412, and 3 Adams 302's. A roller and two small concrete mixers complete the picture.

C. & E. M. Photo
Arizona's Graham County Road Foreman D. W. Colvin examines a shop-made tractor with a Hough loader prior to sending it out on a job.

Eight years ago the county districts

(*Concluded on next page*)

Be wise!
Economize!
Road surfacing's EASY with your Good old faithful

BERG

CONCRETE HI-WAY SURFACER

OLD? Yes! . . . The BERG has been on the market since 1924.
But NEW, TOO . . . . . constantly improved, until today it provides the fastest, easiest, most effective, most economical method available.

The CONCRETE SURFACING MACHINERY COMPANY
6885-6899 Spring Grove Ave. Cincinnati, Ohio

YOU CAN SERVE YOUR CUSTOMERS BETTER with a truck like this!

Here's a picture of a "*Job-Rated*" truck . . . a truck that fits its job.

Take a good look at it!

This truck has exactly the right one of 7 Dodge "*Job-Rated*" engines to provide the pulling power the owner needs, with the economy he wants.

It has exactly the right one of 5 Dodge "*Job-Rated*" clutches, 4 transmissions, 18 rear axles . . . the right units throughout . . . for "top" performance with the loads it carries, over the roads it travels. It is completely "*Job-Rated*" to fit its job . . . to last longer, and for dependable, money-saving operation.

YOU, too, can buy a truck that will fit *your* job . . . giving you better performance at lower cost.

To get such a truck, see your Dodge dealer. He will analyze your needs. He will recommend the right truck. He will serve you well . . . including dependable truck service whenever you need it. . . . See or call him today.

ONLY DODGE BUILDS "Job-Rated" TRUCKS

Fit the Job . . . Last Longer!

Good Gravel Roads On $50,000 Budget

(Continued from preceding page)

were disbanded for road-building purposes. Operations were centered from the modest little yard near the town of Thatcher, under the direction of Foreman D. W. Colvin. He is responsible to Commissioners M. M. Larson, Glen Hoopes, and Ray McEuen, who are elected by the voters. Centralization of responsibility and authority in one man has worked to advantage here.

Irrigation a Problem

In August, at the height of the irrigation season, silt-laden water from the Gila is admitted through the irrigation canals all over the Gila Valley. Excess water often fails to drain off properly. It runs out in the roadside ditches. In a matter of weeks, sometimes only about two weeks, high weeds spring up. The ditch bottoms are of course too soft for the County to use mowers even if it could afford them. Colvin has solved that problem by reaching down with his motor-grader blades and scraping the weeds away. Then as soon as the ditches dry after irrigation water is cut off, he goes in and gives them a real dressing.

The motor graders bear the brunt of maintenance, of course, and they work the year round.

County Crushes Rock

The Cedarapids crushing plant has been a very fine investment for Graham County, because it is turning out low-cost crushed rock for road bases in certain sections where the material is none too good otherwise. A great deal of crushed rock and borrow-pit-run gravel is being loaded for the small jobs by a Hough loader. This machine has an International engine and an Oliver transmission.

According to Colvin, fast moves can be made with the front-end loader, and only one operator is needed as against an operator and oiler on a power shovel. For small jobs, where only one or two dump trucks are working, output is practically the same, he reports.

Bridge Repair

In the mid-thirties a number of concrete box culverts were built without steel. Load stresses and chemical ground reactions are now causing many of these culverts to crack and fail. The concrete mixers are often used to replace or repair these old culverts.

"We are sticking to concrete construction on our culverts, however," Colvin explained. "Despite our bad luck with the old ones, concrete will give permanent and lasting service if it's put in right."

Equipment Repair

The repair of road-building equipment is as much a problem to Graham County as it currently is everywhere else—perhaps even more of one, because Graham County is very much isolated from the manufacturing cities. When machines break down, parts are ordered and when they arrive they are installed in the Thatcher yard. Small operating repairs are of course made in the field.

Colvin has authority to sign the purchase orders, which are then checked by the Board of Supervisors and paid by the County Treasurer. Graham County has no Engineer at present.

Last year Colvin drove 41,000 miles in Graham County inspecting the roads and directing repairs and maintenance. This year he may drive 35,000. "The roads are not in bad shape," he says.

That is what the ranchers say, too, and ranchers are hard people to satisfy.

Gardner-Denver Promotions

A. H. Jones has been appointed Director of the New York City Export Office, according to an announcement made by officials of the Gardner-Denver Co., Quincy, Ill. He was also elected Vice President of the newly formed Gardner-Denver Western Hemisphere Co. with offices in New York.

L. L. Lawrence has been appointed Manager of the Gardner-Denver branch office in Boston. He was formerly associated with the New York City branch.

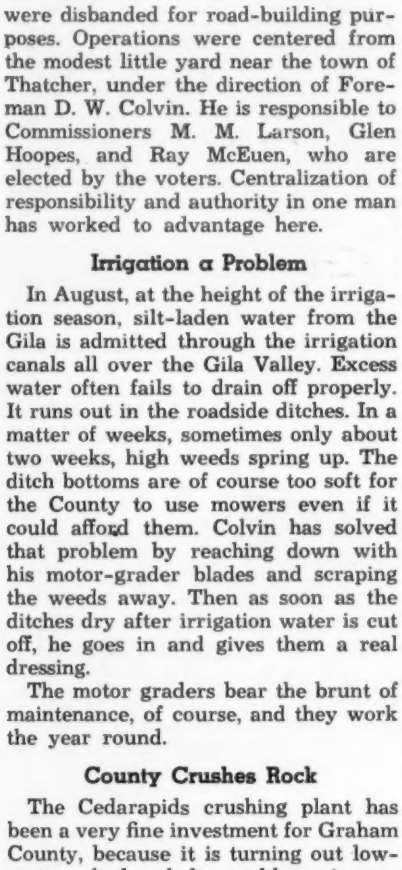
Versatile Radial Saw

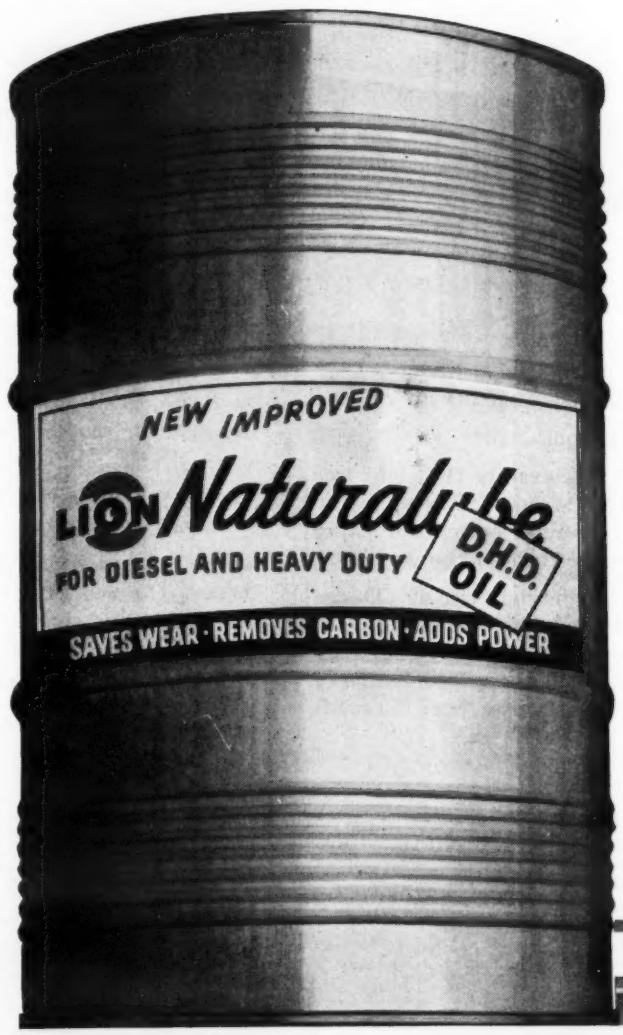
A radial saw which may be used for cut-off, ripping, mitering, dadoing, beveling, ploughing, rabbeting, etc., is made by Construction Machinery Sales Co., 447 Vinton St., Waterloo, Iowa. It is a precision direct-driven tool and can be powered by motors varying in capacities from 1½ to 7½ hp.

All controls for setting the machine are within reach from the front of the working area of the table. With the ram moving through the roller head the working table is free for the shifting of material. The variety of cuts is obtained by tilting the head, leaving the material always in a flat position on the working table. The saw has a complete set of safety guards.

It is also available mounted on a rubber-tired trailer complete with its own generator, for use where a source of current is not readily available.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 47.





Removes Hard Carbon
Resists Sludging
Saves Wear & Repairs
CUTS SHUTDOWN TIME

NATURALUBE D. H. D. IS GUARANTEED!

If you don't believe that D. H. D. is the best oil you have ever used, Lion Oil Company will give you your money back.

For normal service where D. H. D. is not required, use Naturalube Motor Oil (Not so heavily reinforced.)

LION PETROLEUM PRODUCTS

More Power—Lower Operating Costs

Naturalube D. H. D. is refined from a basically different crude oil. It has *natural* ability to remove hard carbon, a naturally tougher protective film and greater *natural* penetrative and adhesive properties. It is non-corrosive—safe! And in addition, it is specially reinforced to give greater resistance to the formation of sludge and lacquer.

To contractors and road builders, that means that D.H.D. saves wear...saves repairs...keeps engines cleaner and able to deliver maximum power. Operating costs are lower because fuel and oil consumption is lower.

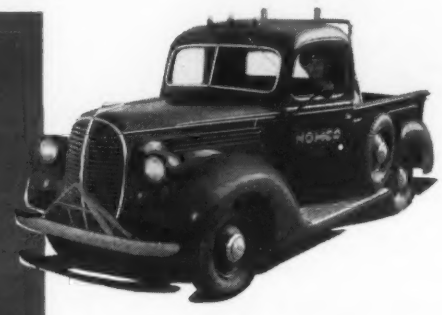
Leading engine manufacturers accept D. H. D. as a superior lubricant. For complete information about Naturalube D. H. D. ask your Naturalube Distributor or write direct to Lion Oil Company, El Dorado, Ark.

LION OIL COMPANY EL DORADO, ARKANSAS

"Certainly

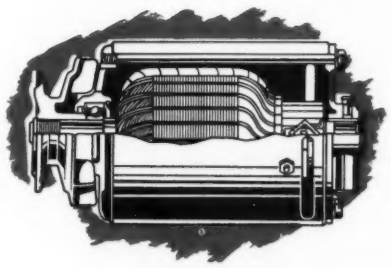
FORD TRUCKS LAST LONGER!"

"That's why we operate 237 of them!"—says C. R. Littlepage, Supt. of Transportation, Houston Oil Field Material Co., Houston, Texas.



Two 1939 Ford Trucks owned by HOMCO that prove the point: (Above) Driver Joe Zachary and Pickup, mileage 207,316; (Below) Driver H. O. Carpenter and Pickup, mileage 228,398. Supt. Littlepage adds: "Our Ford Trucks deliver trouble-free miles at minimum cost!"

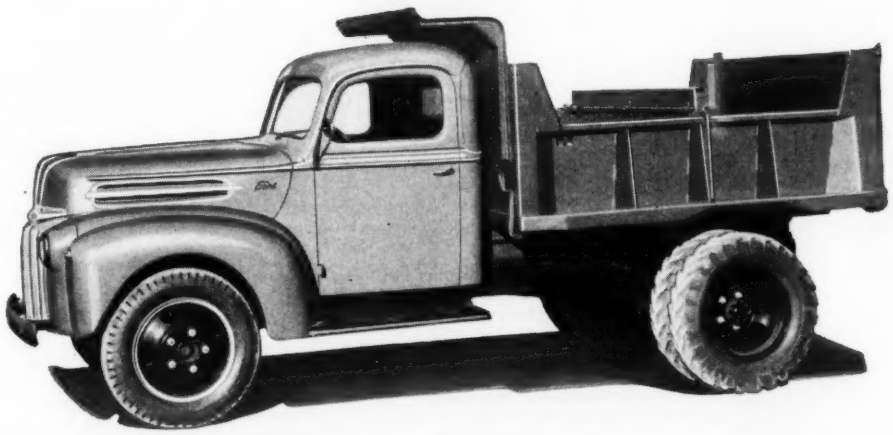
One BIG Reason—
FORD ELECTRICAL UNITS STAND UP!



The fame of Ford Trucks for swift, sure starting and all-weather reliability rests solidly on Ford design and Ford quality . . . in particular, the Ford Electrical System. More than 12 million Ford-designed starter motors and generators have been built in Ford shops. Repeated tests for electrical efficiency consistently prove these fine, Ford-built units to be outstanding. Long, trouble-free generator service is assured by such long-life features as pre-lubricated, sealed ball bearings on armature shafts, and by bushings wick-lubricated from a reservoir with an overflow drain, which prevents surplus oil from reaching commutator. Ford starter motors are pre-lubricated, requiring no oiling whatever. Ford wiring and generous battery and generator capacity adhere strictly to the highest standards of the industry. The simplicity and high efficiency of the Ford starting system circuit, too, have much to do with Ford's faithful starting performance.

Ford

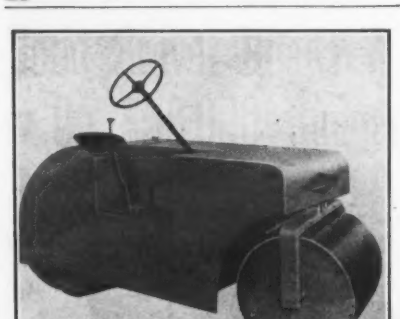
THE 6 YOUR PICK OF POWER THE V-8



Hauling bulk building and street construction materials, the Ford Dump Truck chassis provides capacity, maneuverability and long life that have made it a prime favorite everywhere. This shows an 8-foot-long center-gate Dump body for "batch-work," by Anthony Company, Streator, Illinois.

Only Ford Brings You All These Long-Life Features: Your choice of engines, V-8 or SIX—each with new Flightlight oil-saving 4-ring pistons and precision bearings · true truck frames in all models, with siderails *doubled* in heavy duty units · rear axle shafts free of weight-load, ¾-floating in half-ton units, full-floating in all others · big, easy-action brakes with non-warping, score-resistant cast drum surfaces—in all, *more than fifty* such endurance engineering features! And more than 100 body-chassis combinations to choose from. See your Ford Dealer now!

MORE FORD TRUCKS IN USE TODAY THAN ANY OTHER MAKE!



A streamlined housing encloses all operating mechanism on the Clyde new Model 60 tandem roller. Automotive-type steering and a short wheelbase for maneuverability feature the unit.

Tandem Roller Has Automotive Steering

Production is now under way on a new tandem roller at the plant of the Clyde Iron Works, Inc., Duluth 1, Minn. The new Model 60 weighs 4,840 pounds empty and 7,200 pounds when filled with water. The company also makes the Model 20, a one-ton roller.

The Model 60 has automotive-type steering and is powered by a 4-cylinder gasoline engine. It has a short wheelbase said to permit maneuvering in close quarters. Compression of the rear roller is 67 pounds empty, and 107 pounds filled. Overall length is 110 inches, width 49 inches, and speed of travel 3.75 mph. The rear roller is 36 inches in diameter and 42 inches long; the front roller is 28 inches in diameter and 18 inches long.

The Model 20 has a direct steering arm, and is powered by a 5-hp air-cooled engine. Compression of the rear roller is 40 pounds empty and 61 pounds filled. Overall length is 76½ inches, width is 34 inches, and speed of travel is 2.8 mph. The rear wheel is 26 inches in diameter and 28 inches long; the front roller is 16 inches in diameter and 12 inches long.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 3.

Improved Engine Oil

Cleaner engines, more power, improved gasoline and oil mileage, and smoother, more dependable lubricating performance are claimed for its new motor oil by the Amalie Division of L. Sonneborn Sons, Inc., 88 Lexington Ave., New York 16, N. Y. The new oil, Amalie E-D (Extra-Dûty), is designed for use by gasoline-driven fleets.

Amalie E-D is said to protect against carbon and varnish formation, sludge deposits, bearing corrosion, and breakdown or deterioration of the oil itself. It is claimed by the manufacturer that it has the ability to prolong engine and oil-filter life, end dry starting, overcome foaming troubles, and purge and wash away harmful products of combustion. It is available in SAE grades 10, 20, 30, 40, and 50 (sub-zero for winter).

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 19.

Steel Bridge Flooring

Open structural-steel gratings for use in bridge flooring, drainage gutters, etc., is described in a series of catalogs distributed by the William F. Klemp Co., 6601 So. Melvina Ave., Chicago 38, Ill. Types covered are the Klemp Diamond grating, welded grating, safety stair treads, Floorsteel, and Hexteel.

The catalogs describe the different patterns and styles, their applications, specifications, and other related information. The method of installation is described. And features of the fasteners, anchors, and other hardware are listed. Also included is a table which lists safe loads for the Diamond and welded-steel gratings.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 89.

Hose Couplings, Fittings

Its line of air-hose couplings and fittings is described in Bulletin No. 300 of The Dallett Co., Mascher at Lippincott St., Philadelphia 33, Pa. The Dalbo line includes pipe ends, hose ends, Y couplings and fittings, coupling gaskets, air valves, blow guns, hose nipples, hose menders, swivel nipples, male and female bushings, hose clamps and clips, air hose, hose sections, manifolds, etc.

The catalog shows photographs of each item; it also gives specifications and sizes of each and its catalog number. Printed on glossy paper, the 8½ x 11-inch folder is suitable for insertion in a three-hole looseleaf notebook or standard stock catalog.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 66.

VICTOR
The range of a
VICTOR welding torch
is so great, even this picture fails
to do it justice... write for VICTOR folder Form 43.

VICTOR EQUIPMENT COMPANY, 844 FOLSOM STREET, SAN FRANCISCO 7, CALIF.

THIS ABLE-BODIED WORKER NEVER MISSES A DAY!

THE MODEL "M" Dorsey MACHINERY TRAILER with Built-In DURABILITY DEPENDABILITY ECONOMY

The rugged Dorsey Model "M" Machinery Trailer does big jobs in a big way! No breakdowns!—no delays!—skilled Dorsey engineering specifies only high-quality materials and master craftsmanship . . . resulting in 3 outstanding features that make Model "M" operation—

Dependable! — the Model "M" is always on the job . . . a gold-star workman putting in a full day's work *every day* for your greater profit!

Durable!— the Model "M" takes any hauling job in smooth, easy stride . . . from 15 to 25 tons!

Economical! — the Model "M" combines *Durability* and *Dependability* to give fast, low-maintenance heavy machinery transportation—any and *every* time you want it!

Ruggedly built for steady service . . . promising a long, uninterrupted work-life . . . The Dorsey Model "M" Machinery Trailer boasts—

Positive Action Brakes to assure Passenger Car control—and safety!

Patented Tubular Trunnion-type Axles to absorb road shocks and ease wear and tear on the trailer!

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Contractor Develops New Canal Machines

A New-Type Trimmer and Special Gunite Equipment For Irrigation Canals Are Built by Macco Corp.

(*Photo on page* 1)

✦ TRAVELING across country at speeds up to 400 feet an hour, special trimming and Guniting machines developed by Macco Corp. of Clearwater, Calif., have established a new record for performance on small lateral irrigation canals. Under a $254,000 U. S. Bureau of Reclamation contract, Macco developed the rigs specially for work on the Gila Irrigation Project near Yuma, Ariz. This job, finished last month, is the second to be done by Macco on the Yuma Mesa Division.

Nine miles of Gunite-lined laterals and 2.9 miles of Class A concrete-lined work on the main "A" feeder canal were included in the contract, with 157 structures of all types. The structures will serve to turn irrigation water into land to be opened for homesteading next year. The present development of the Yuma Mesa Division will be about 25,000 acres of potentially irrigable land from Yuma towards the Mexican border.

For the construction of small lateral canals, Macco has developed a radical new excavator and trimmer called the Gimmick. The Gimmick is now patented by the company. With ground speeds of from 1½ to 2½ fpm, this trimmer opens up so much canal that other special Guniting machines were built to keep pace. A portable compressor unit delivering 1,000 cubic feet of air per minute is believed to be one of the largest portable air compressors ever built. It is used to run two Gunite guns simultaneously.

A special trailer-mounted Gunite-mixing and proportioning machine, developed under the supervision of Macco's Harry Holland, also fits into the picture. Details of these machines will be given later in proper order.

Project History and Design

For many a decade now, men have gone to the mighty Colorado River for water to irrigate their farms. So the Yuma Mesa Division of the Gila Project was nothing new when it was conceived. The first investigation as to its feasibility was authorized under the Boulder Canyon Project Act, and the first surveys were made in 1934. First allotments for construction were received in 1935 for the Gila Project, and the route of a man-made river from Imperial Dam towards Yuma was started. Ultimately a 52-foot pump lift was built into the system to raise water to the high mesa overlooking the city of Yuma.

Construction of irrigation works on the mesa was started by contract in 1941, but the work was suspended for the duration of the war by the War Production Board. In 1942 the first water arrived on the mesa. And during the war several hundred acres of private land and developed public land in the "dust-control" tract adjacent to the Yuma Army Air Base were irrigated. But all construction contracts were terminated until work was resumed in 1945.

The Yuma Mesa will be irrigated through a system of variable-capacity laterals with hydraulic capacities as low as 15 cfs. The "A" canal, main feeder for the development, carries 620 cfs at its intake but dwindles in size to 135 cfs at the present Macco Corp. contract. A "B" canal, which is a secondary feeder, carries 280 cfs where it turns out from the main "A" canal.

Regardless of capacity, the laterals were all designed with identical side slopes of 1½ to 1, varying as necessary the bottom and top widths and the depth. This factor influenced to some extent and made possible the design of the trimming Gimmick.

One of the unusual aspects of the Yuma Mesa job is the fact that the Bureau of Reclamation is leveling the irrigable public land prior to settlement. This work, done by contract and force account, cost approximately 20 cents per cubic yard, according to John K. Rohrer, District Manager in charge of the Yuma District Office of the Bureau of Reclamation. The cost of land leveling will be repaid over a period of years by the people who take up the 40 to 160-acre tracts in this development.

(*Continued on next page*)

C. & E. M. Photo

This general view of Gunite preparation on the Macco canal job shows the weighing hopper on the wheel-mounted monorail fastened to the trailer which mounts the Rex mixer. The Gunite mixing rig, in turn, is coupled to the huge portable compressor behind it. Notice the cement sacks piled beside the rig.

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When it comes to the *tread*, each is field-designed to *deliver the goods* on the job for which it is built!

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C. & E. M. Photo
Job Superintendent E. F. "Beanie" Davies poses on the Macco Corp. canal job.

Contractor Develops New Canal Machines

(Continued from preceding page)

As western reclamation frontiers are pushed farther back, the preliminary preparation of farm lands will be a factor of ever-increasing importance.

The Macco contract was let under specifications which stipulated that all materials, structure gates, and construction supplies would be furnished by the Bureau of Reclamation.

Preparation of Berm

When Macco started the job on October 14, 1946, most of the compacted embankments which carry the laterals had previously been built. The presence of caliche and other earth with high binding qualities caused these embankments to set up like concrete, so tight that surveyors could hardly drive anything but steel pins.

A LeTourneau Rooter was brought in behind a Caterpillar D8 tractor, and used with two teeth to rip up the top of the trench. Other passes with a single tooth opened up the ground so that an Austin-Western 99 motor grader could come in and scoop out the ripped-up earth with its blade. A pioneer canal was thus dug somewhere close to the center line and grade of the finished lateral.

Water was then admitted from the "A" canal. The ditch was filled, and kept that way for at least a week. Water seeped into the hardened ground, saturating it and making it easier to dig. After a week of this treatment the hardened soil changed back to its original characteristics, and it was then possible to trim the remainder of excavation with the Gimmick.

Special Trimmer

This special trimming machine was the product of imaginative mechanical minds in the Macco organization. The crawler tracks were originally those of an old 27-E MultiFoote paver. The drive gears from the Waukesha main engine to the cutting blades came from a Linn Haftrack. Steering clutches were borrowed permanently from a Caterpillar D8 tractor. The 24-inch rubber conveyors were trunnion-mounted on rubber tail wheels from airplanes, and driven by electric motors from a 7½-kw generator.

The machine will dig a lateral up to 5 feet deep and 15 feet wide. Bottom width can be adjusted, as can the location of teeth on the blades which dig the flat berm at the top of the lateral lining. The Gimmick's cutting blades are mounted on a frame. They are set in place at a stationary slope of 1½ to 1 to coincide with the neat lines of the canal section. The drum, or framework which carries the cutting blades, revolves around the conveyor belts and excavated dirt is dumped to these conveyors as the cutting blades rotate. Twin conveyors deposit the excavated material on both sides of the canal, to bring the canal berm to proper width.

The cutting-blade drum can be raised or lowered at will by cable controls. And the machine can be kept on line and grade by a mechanical pointer which follows a tight wire stretched to line and grade between survey hubs. It even has a stabilizer indicator pointer which shows exactly how plumb the cutting drum is at any time. Needless to say, Gimmick operators Jack Neal and "Curly" Duncan try to keep the pointer on the plumb mark at all times.

With variable ground speeds up to 2½ feet per minute, the Gimmick rambles along at a remarkable rate as it digs the small canals to grade. After it passes by, a grade man checks the canal with the surveyor's stakes.

If the embankment was not thoroughly wet when the Gimmick passed by, chunks of earth tore loose and left holes in the side slopes. Where this happened, as it did in several places, the holes had to be backfilled and tamped by hand labor.

(Continued on next page)

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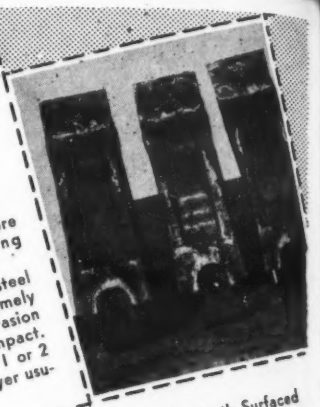

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Contractor Develops New Canal Machines

(Continued from preceding page)

The trimmer stayed generally about 500 feet ahead of Gunite operations. No more ditch than that was opened up because of the unusually high winter winds near Yuma. Howling across the barren sand desert, this wind would sandblast the equipment and almost cover the tracks with drifted sand each day. Men showed up for work at 8 o'clock, but by noon when the wind arose their productivity dropped off. Goggles and heavy clothing were no real protection.

North of Yuma in the picturesque mountains is Picacho Peak. That peak was the working guide for Indians employed on the job. In the lore of Indian legend, Picacho Peak will be obscured by haze when the wind is going to blow. They used the mountain as an infallible guide. If morning haze dimmed its glory in the eastern sun, they just stayed at home.

Guniting Machines

One of the most remarkable developments in western Guniting has been introduced by Macco in the form of a complete portable Guniting set-up capable of lining 300 feet at one stop. Features of this rig include a huge portable compressor, which was operated by Buzz Davisson; a truck-mounted mixer with Gunite pressure chambers and pumps; and high-capacity water wagons. All equipment on this job had all-wheel drive, and for that reason it could pass through sand that would trap other machines.

Macco made the portable compressor out of a White truck chassis, three 365-cfm Gardner-Denver air compressors, and two General Motors diesel engines. The three compressors are V-belt-driven off the General Motors diesels, and furnish the air necessary to boost mixed sand and cement at high speed through the Gunite gun hoses.

The firm took another trailer chassis and mounted a Rex ½-cubic-yard mixer near the front. A circular bucket conveyor was placed behind the mixer, to take mixed material and dump it on a shaker screen above a small feeder hopper. This shaker screen removes all cement lumps or particles larger than ⅜ inch.

Two Cement Gun Co. pressure pots were installed under the feeder hopper. A 4-cylinder compressed-air motor in each of these pots drives the mixed Gunite at high velocity towards the gun nozzle, where water is added at a slightly higher pressure to give the Gunite its proper consistency.

But the crowning touch of ingenuity to the whole machine is the very simple but efficient method of adding sand to the Rex mixer. A steel monorail was wheel-mounted at the traveling end and fastened to the trailer chassis at the other. A traveling hopper, mounted under a dial scale, was set in place. Instead of having to rehandle sand through wheelbarrows in the conventional manner, three laborers shovel a batch into this hopper, scoot it over to the mixer skip, and dump it. Bag cement can be added immediately afterward.

The monorail is hooked to the Gunite mixing rig, and the Gunite rig can be coupled to the portable compressor for routine work. It was never uncoupled except when long changes of location were made from one canal to another. Incidentally, everything on this job had some sort of name, and the stiffs called the high-capacity compressor "Big Wind".

Two 2,500-gallon water tanks on White 6 x 6 all-wheel-drive trucks hauled the mixing water from the main irrigation canal. Ordinarily they took on water by means of two Chrysler-engine-driven CMC pumps, but both water wagons were equipped with pumps of their own. They could take on or discharge water under pressure if necessary.

C. & E. M. Photo

Lining for the Gila lateral canals was placed 1½ inches thick by Macco Corp., and two Gunite guns were used simultaneously. This picture also shows a finisher who dressed the lining and the ¾-inch-deep dummy contraction joints on 5-foot centers.

Victor portland cement in sacks was trucked in and unloaded in neat stacks every 300 feet. No boards were necessary on the ground, but each pile was covered by a tarpaulin. The sand aggregate for the Gunite mix was hauled in under a subcontract with Yuma Concrete Products Co., and dumped at the work site in the right amount to build 300 feet of lining 1½ inches thick.

The proportion for this job was one part of cement for four parts of sand. When the material passed through the Rex mixer for 90 seconds, it came out slightly damp. Enough moisture was added at the gun to cause it to stick, but not enough so that free moisture would show.

This set-up has enough air capacity and hose to run two Gunite guns. The two guns usually worked towards the center from both ends of the 300-foot stand. On the day the job was visited for CONTRACTORS AND ENGINEERS MONTHLY, two Bureau of Reclamation inspectors

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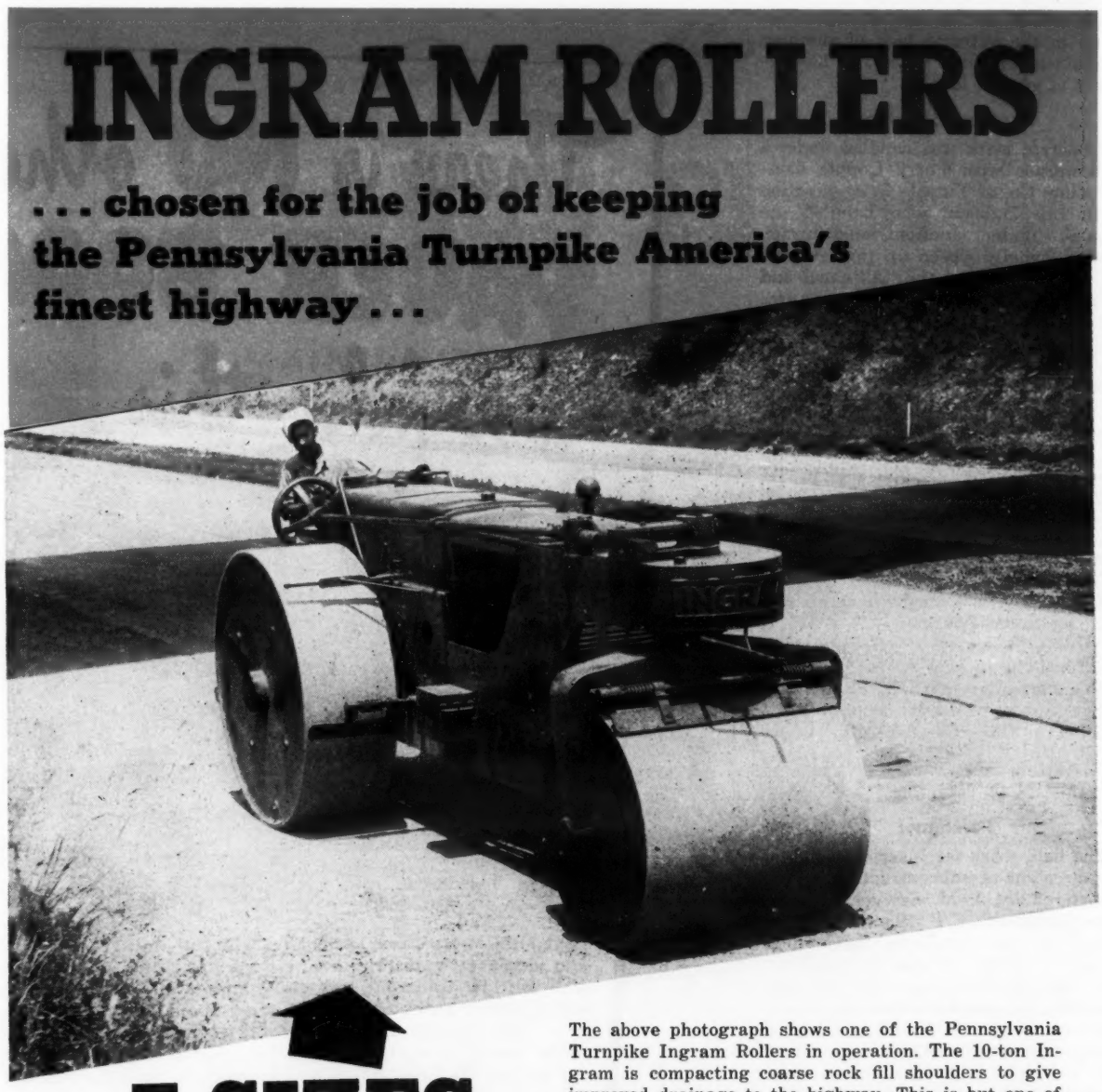

5 SIZES
4 to 12 TONS

The above photograph shows one of the Pennsylvania Turnpike Ingram Rollers in operation. The 10-ton Ingram is compacting coarse rock fill shoulders to give improved drainage to the highway. This is but one of the jobs made-to-order for Ingram Rollers.

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Contractor Develops New Canal Machines

(*Continued from preceding page*)

busily set thickness nails 1½ inches from the earth face just ahead of the gun operators.

The Gunite lining was dressed by finishers with steel trowels, and a dummy contraction joint was cut ¾ inch deep on 5-foot centers behind the finishers. This joint reaches from top to top of the canal. It was filled with Enamelite mastic filler, applied under air pressure through grease guns. A small Wisconsin-powered compressor furnished air for that operation.

Hunt Process solution with white pigment was applied by spray after the Gunite finishers were through. A small portable compressor was also used for that work, and the 55-gallon drums were handled from stands.

Construction joints were placed on 300-foot centers, and at all structures. They will allow the canal lining to expand in the extreme heat of summer, when temperatures go above 130 degrees at ground level.

Concrete Structures

Concrete work was handled under a subcontract with Perry Copple Construction Co. of Yuma. In cooperation with Lee Dubach, who handled the cement under another subcontract, Copple rapidly closed up the few unfinished sections of the "A" canal and started to work on the many structures on this project.

The layout of forms on this small-size canal called for some of the highest possible carpentry skill. Some of the transitions are complicated. Copple used the best carpenters in Yuma, and set up shop right out on each structure. The forms were set in place, oiled, and checked for alignment before each pour. Frequently the forms he used were good for only one pour, though there were numerous other different structures in his job.

His pours were made by weighing sand and aggregate at the Rex mixer, and adding bag cement. A water tank furnished the mixing water. Concrete with a water-cement ratio of 5.8 gallons per sack was mixed for structures according to the following proportions:

Sand	1,144.82 lbs.	0.467 cu. yd.
¼-inch gravel	887.50 lbs.	0.355 cu. yd.
½ to 1-inch rock	1,110.40 lbs.	0.427 cu. yd.
Cement	5.56 sacks	

Personnel

The field work for Macco Corp., and the direction of subcontracts, was administered by J. M. Sawyer, General Superintendent. E. F. "Bennie" Davies, one of the top-notch superintendents of the Macco Corp., was Job Superintendent. Bennie is the man who attracted attention last summer when he built a dam near Goleta, Calif., in 2 months and 2 days. It wasn't a small dam, either

C. & E. M. Photo
Complicated transitions, like this one from the main "A" supply canal of the Gila Irrigation Project, called for skillful form work. Perry Copple Construction Co. handled this concrete work under a subcontract.

. . . 170,000 cubic yards of dirt, with riprap facing, a 34-foot Gunited spillway, and concrete outlet works.

Other Macco men on the job were Master Mechanic John Whitlow, Gunite Foreman Ed Dubrinsky, Labor Foreman William Daniel, Engineer Ted Rowe, Office Manager Jack Reynolds, and Steel Foreman John Beltran.

Work on the Gila project is under the direction of the Bureau of Reclamation, headed by Commissioner Michael W. Straus in Washington, D. C. Walker R. Young is Chief Engineer with headquarters at Denver; and E. A. Moritz is Regional Director of Region III in which the project is located, with headquarters at Boulder City, Nev. District Manager John K. Rohrer, with headquarters in Yuma, Ariz., is in immediate charge of the project with T. A. Clark as Construction Engineer.

Heavy-Duty-Truck Data

A new broadside describing its M Series trucks is now being distributed upon request by The Four Wheel Drive Auto Co., E. 12th and Auto Sts., Clintonville, Wis. This folder covers trucks in the 10 and 12-ton class.

In addition to showing photographs of the trucks in use on many varied jobs, Bulletin 461 describes the principle of four-wheel power transmission. It also shows views of the 150 to 200-hp gasoline or diesel engines used on the M Series trucks.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 77.

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The ideal general purpose drill, equipped with back gears and power feed, ratchet type lever feed, wheel feed and automatic stop. 8 Spindle speeds and 3 rates of power feed. Available with either tight and loose pulley drive for countershaft power take-off, or electric Vee belt, or geared motor drive. Capable of close, precision drilling. Rugged one-piece semi cast steel construction. Accurately machined table and base. Table pivots, swings 360° around column. Write for full details.

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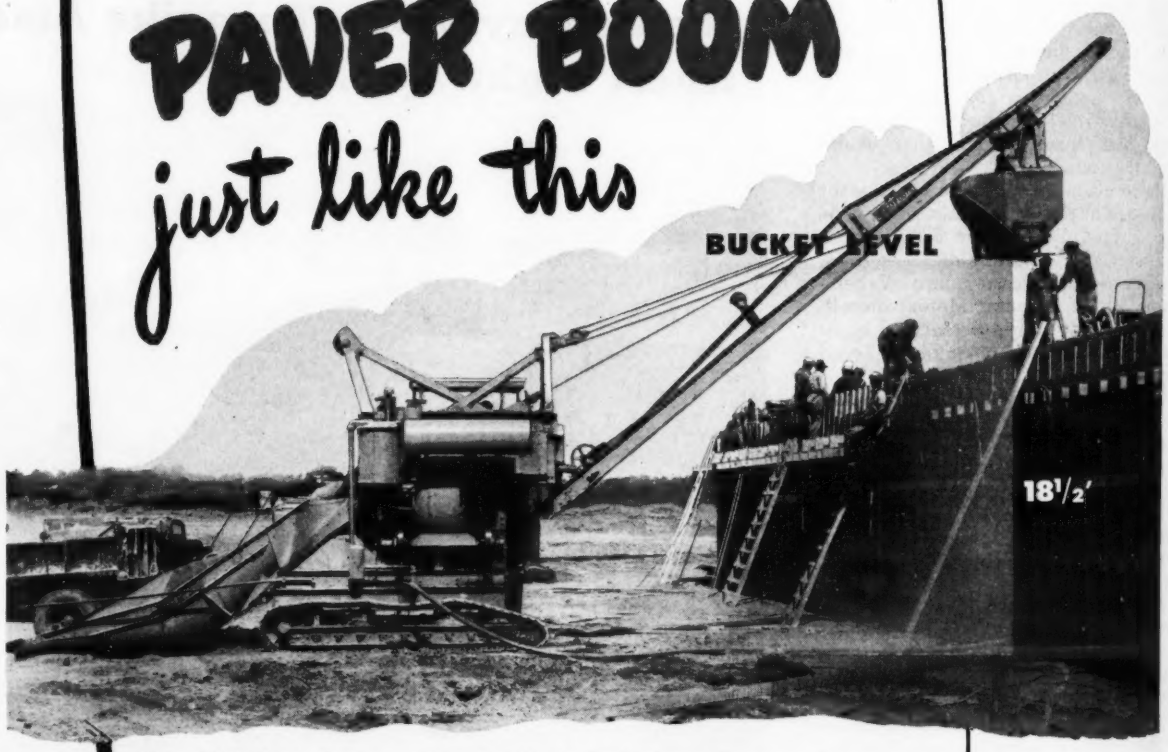


Your MultiFoote Paver, equipped with the MultiFoote Elevating Boom, gives you increased versatility over a wide breadth of jobs. The average retaining wall, bridge abutment, one-story foundation and reinforced concrete wall are all within reach of your Elevating Boom.

With your MultiFoote you mix and place without the aid of a crane or other auxiliary equipment on this kind of work. It means less investment for equipment—less handling of materials—and faster pouring—all of which totals greater profit!

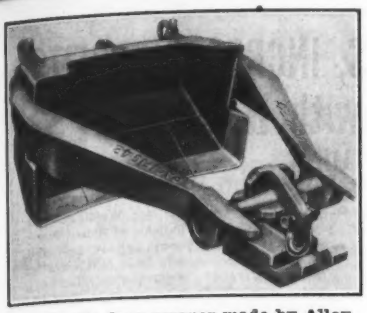
Do not be misled by other terms for standard booms that can be raised to limited degrees. The MultiFoote Elevating Boom was designed specially for pouring to heights beyond the possibilities of the standard boom and was the first of this type. The MultiFoote Elevating Boom has met the rigorous conditions of all kinds of work and is the *only* elevating paver boom that has been proved in years of service. Let us send you complete details. It is available for both the DuoMix (Dual Drum) 34-E and the Single Drum 34-E Pavers.

THE FOOTE COMPANY, 1916 State Street, Nunda, New York

Also see page 58

MULTIFOOTE CONCRETE PAVERS

Builders of **ADNUN BLACK TOP PAVERS, MULTIFOOTE CONCRETE PAVERS, AND FOOTE KINETIC MIXERS**



The Pacific drag scraper made by Alloy Steel & Metals Co. features a balance said to put the entire weight of the unit into the digging action. Three models and six sizes are available.

Balance Is Feature Of New Drag Scraper

A new drag scraper is announced by Alloy Steel & Metals Co., 1860 E. 55th St., Los Angeles, Calif. Scientific balance is claimed as the outstanding feature of the line.

This balance is said to put the entire weight of the scraper into the digging action. Yet when the scraper is loaded, the digging action ceases, according to the manufacturer; this relieves the scraper hoist of excessive power requirements. On the back haul the scraper tips back on runners; this lifts the cutting blades above digging level and saves wear.

Pacific drag scrapers are provided with newly designed self-sharpening corner cutters. The shoe, which attaches to the front of the harness, is made of a tough, wear-resistant manganese steel which balances the scraper under service conditions and protects the harness and cable shackle from wear.

The scrapers are available in three models and six sizes to handle varied service requirements: Model A in 26 and 30-inch sizes, Model B in 36 and 42-inch sizes, and Model C in 48 and 60-inch sizes.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 94.

New Metallic Coating And New Welding Rod

A new metallic coating for welding rods, developed by the Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y., has been issued two United States patents. Eutectofilm, as it is called, has been made standard on most EutecRods, another of the company's products.

The company claims the following advantages for its Eutectofilm: (1) improves the welding characteristics of the rod; (2) insures high physical properties in the weld deposit; (3) assists in surface alloying at low base-metal heats; (4) protects the filler rod from corrosive attack which would have a detrimental effect on weld metal and its flow.

Also announced at the same time is a new type of welding rod which is said to require less heat and which can be used on cast iron, steel, copper, brass, aluminum, zinc die castings, and for overlaying.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 39.

Saw, Tool, File Manual

A 48-page saw, tool, and file manual is available to interested readers from Henry Disston & Sons, Inc., 103 Tacony St., Philadelphia, Pa. It opens with a brief résumé of the history of the Disston corporation, and gives information on how to choose and use all types of saws; how to sharpen them; how to choose and use files and hand tools; and how to care properly for saws, tools, and files.

All items made by the organization are listed; photographs and drawings accompany the text describing vital features, best uses, and the sizes in which each is made. The booklet is indexed for easy location of data.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 83.

Motor-Grader Catalog

A catalog describing the Trojan motor grader and attachments has been issued by Contractors Machinery Co., Inc., Clinton St., Batavia, N. Y. Catalog P-47 gives complete specifications for this Utility Speed Patrol including weights, dimensions, blade assembly and control, power unit, tires, and speeds.

The bulletin also devotes a page to each of the Trojan accessories including scarifiers, bulldozers, V-type snow plows, and patrol cabs and canopies.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 51.

A Roller For Every Job

Sturdy, heavy-duty rollers, engineered to stand up under the toughest conditions. Pierce-Bear Tandem Rollers are powered by economical Allis-Chalmers 4-cylinder industrial type gasoline engines. Variable weights, from 3½ to 5 tons with built-in water tanks for ballast and wet rolling.

Pierce Baby Bear 2½-3 tons

Pierce Medium Bear 3½-5 tons

The new 2½-3-ton Pierce Baby Bear is designed for close-in work and small area maintenance. It works against a curb up to 25 inches high and within 1½ inches of a higher wall or building. Final drive is within the rear roll. Use Pierce-Bear Tandem Rollers for all-around performance. Write for folder.

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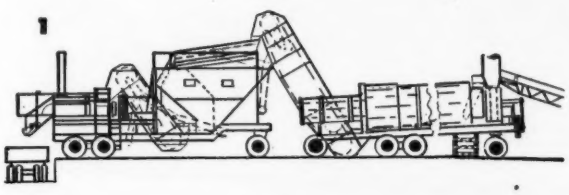

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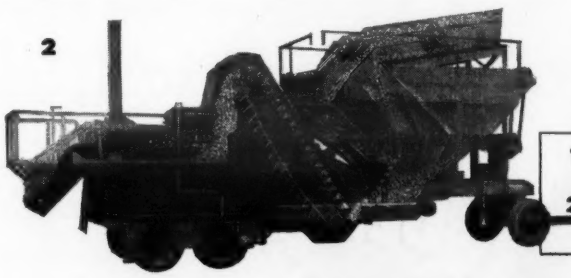

THE NEW *Continuflo* Central Mix Asphalt Plant brings you the most portable and compact continuous process asphalt plant ever built. It is recognized as one of the great developments in asphalt equipment.

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In *Continuflo*, all mixing operations are fully automatic. The asphalt metering pump is interlocked with the aggregate feeder to provide correct proportioning of bitumen and aggregate. There is no variation in the finished product. The human element is out—the correct mix is assured!

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2 *A COMPACT PLANT*—Gradation and Mixing Unit combines on one truck the gradation screen, proportioning unit, transfer elevator and mixer.

Buy Both!

Higher Output, Lower Upkeep!

Pioneer

Continuflo EQUIPMENT

Mounted on a half-track chassis, this 3-ton Day-Smith crane is designed for contractors' use.

Half-Track Mounting For Hydraulic Crane

A 3-ton-capacity full-hydraulic crane mounted on a half-track chassis has been put on the market by The Day-Smith Hydraulic Crane Corp., Bowling Green, Ohio, and Camp Hill, Pa. These material-handling cranes are said to be well adapted to contractors' or state and county highway department use where mobile equipment is heeded.

The maximum distance from the ground to the hook at the extreme height of the boom is 18 feet. Vertical boom travel is 10 feet; vertical travel of the ½-inch cable is 16 feet. Total weight is 16,800 pounds. All power cylinders are double-acting and give power up and power down. The truck engine is a 450-cubic-inch International Harvester. The unit is known as the Day-Smith Lugger Crane. Immediate deliveries are being made.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 31.

Nylon-Cord Truck Tire

A truck tire with all plies made of nylon cords has been developed by The Goodyear Tire & Rubber Co., Akron, Ohio. The main problem encountered with nylon cord has been its tendency to grow or stretch in service. Goodyear technicians are said to have perfected a pre-stretching technique which reduces this tendency. There have also been developed adhesives which make possible bonding between the nylon-cord tire materials and rubber.

Features claimed for its tire by Goodyear are greater strength and resistance to bruising and heat. Due to extended life of the cord carcass, the company says, the tire can be recapped many times.

First truck tire in the Goodyear line to incorporate all-nylon construction in plies and cushion is the Hi-Miller Xtra Tred. Due to current limited supplies of nylon tire cord, production of all-nylon tires will be on a limited basis.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 96.

Concrete-Form Accessories

Descriptive literature on form clamps and accessories is available from the Universal Form Clamp Co., 1238 No. Kostner Ave., Chicago 51, Ill. Catalog 604 is a 16-page heavy-bound bulletin on the Uni-Form system of wall-form construction. Catalog 902 lists the various form ties used with conventional types of wood forms and describes bar supports for all types of reinforced-concrete structures. Also available is a broadside covering foundation units.

The catalogs list the features of these form specialties; they give the sizes in which they are made, and other information of interest to concrete contractors. The bulletins are thoroughly illustrated with photographs and drawings. Complete specifications are given.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 90.

Surveyors' Equipment

Twelve pages of information on the transits and levels manufactured by the David White Co., 305 W. Court St., Milwaukee, Wis., are contained in Bulletin No. 1046 issued by that company. Free upon request, the bulletin contains all specifications and prices for the instruments and accessories, as well as a large number of photographs and drawings.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 57.

Raybestos Calif. Dealer

The appointment of Asbestos Co. of California, 941 16th St., San Francisco, as its representative in that area, has been announced by the Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J. The company will carry a complete stock of belting, V-belts, hose, and other Raybestos industrial rubber products.

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How does RPM DELO OIL Cut wear?
It's compounded to:
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2. Stop bearing corrosion
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NOTE: Thank Guy Warren, Hayward, Calif. for tip on RPM DELO OIL

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Two Maintenance Men Talk Things Over for Us

"Road Doctors" Pass Along Some Tips on Laying a Smooth Patch and Other Phases of Highway Care

By RAYMOND P. DAY,
Western Editor

✦ WHAT about the maintenance foreman? What are his problems? Is his a lonely life? How soon after a construction job ends do his labors begin? Is there any adventure in his kind of work?

Far out beyond the Pecos River, where the state of Texas stretches for endless miles, there are two men who can give you the answers to those questions. They have been at it now for half a lifetime, between them.

One is a quiet, mild-mannered man named R. A. Warnock, Maintenance Foreman at Fort Stockton for 20 years. The other is tall, rangy, weatherbeaten John M. Billings, who has held the same kind of job for better than 16 years. What they have learned in those years has benefited the state of Texas, and it can benefit any maintenance man, wherever he may be.

They have their yards and shops side by side on the eastern edge of Fort Stockton, county seat of Pecos County. It is the only county in Texas with the headquarters shops of two state-highway maintenance foremen. Towards the west are 168 miles of state highways maintained by John Billings and his men; towards the east Warnock's 196-mile state-highway system lies. The dividing line is the railroad track at Fort Stockton.

Warnock Has Pavement

With the completion of a short piece of asphalt penetration surfacing last year, Warnock's 196 miles are now all paved. He can remember, not too many years back, when not a mile in his district was surfaced. He has watched it grow for 20 years from raw trails through the mesquite-dotted plains to a modern high-speed highway system.

The most important thing that ever happened to Warnock's maintenance crew was that under him they learned to make a professional patch on a highway. The evolution has been slow, but his district now applies a maintenance patch to which he can point with pride.

CONTRACTORS AND ENGINEERS MONTHLY has carried the story of the mechanical composition of the pre-mixed patch material, its research and development. (See April, 1947, pg. 1). But the methods of applying this material have varied. Now, when you ride across a Warnock patch, you can tell it's patchwork only because it rides more smoothly than the original construction.

It all came about when Warnock made the simple common-sense deduction that low places in a highway surface were never perfectly square and seldom perfectly round. Instead, they were more inclined to be odd-shaped. He also noticed that water puddles standing after a rain outlined them perfectly. So he began to send a few men out after it had rained, to paint the edges of puddles with a small hand brush and emulsified asphalt. And they came up with some of the oddest designs he had ever seen. They resembled no patch he had looked upon.

The emulsified asphalt stayed on the original pavement for months, and eventually Warnock's maintenance gang got around to some of the odd-shaped low places.

C. & E. M. Photo
Maintenance Foremen Warnock and Billings have their offices and storage yards side by side on a 280 x 150-foot lot at Fort Stockton. They have a 300-foot well, and they share not only a windmill and water-storage tank, but the characteristic of neatness.

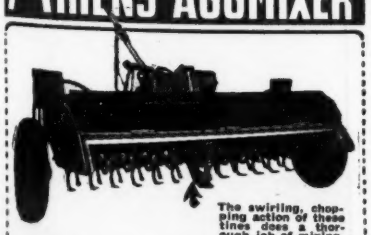
They began to stretch a string line from one side to the other on these low spots to see just how thick the patch would have to be. And they began to tack the patch down with a sweep coat of emulsion—even to cut 50-50 emulsion by another 50 per cent. Soon they had a patch that would stick, all right.

But it wasn't smooth.

Up to that time a garden rake was the only instrument they had used for smoothing down the pre-mix. "Credit

(*Continued on next page*)

FOR SECONDARY ROAD CONSTRUCTION...
ARIENS AGGMIXER



The swirling, chopping action of these tines does a thorough job of mixing, wet or dry.

HERE'S equipment designed especially for mixed-in-place construction—to operate in connection with other general purpose equipment. Wherever aggregates are used it thoroughly pulverizes, mixes and aerates aggregates with binder—rapidly and economically. Also ideal for soil cement stabilization. Safe and easy to operate . . . adjustable to any tractor . . . made 4 standard sizes, 4', 5', 6' and 7'. Write for details.

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C. & E. M. Photo
Tall rangy John M. Billings, left, and mild-mannered R. A. Warnock, right, have been Texas state-highway maintenance foremen for a total of 36 years between them.

Two Maintenance Men Talk Things Over for Us

(*Continued from preceding page*)

goes to a truck driver here for developing the float we now use," Warnock explained.

"This boy happened to pass a bridge job under construction one day, and he picked up an old bullfloat the finishers had thrown away. He brought it up to our maintenance gang, and suggested they try it in lieu of the usual rake.

"Well, the thing worked better than any raking tool we'd ever used before. And it made the surface of the pre-mix smoother."

Warnock told also how the present hollow-steel float was discovered accidentally. The wood floats had been wearing round, and maintenance crews were requisitioning so many new ones that the stock-room clerks were on the point of protesting.

"Then one day one of the boys happened to pick up a steel float on a construction job. Figuring it would last longer than wood, he brought it out to his patching job. That night he came to me and said, 'I've found it! I've got just what we need!' "

Nowadays Warnock's crew uses nothing but these long-handled wide steel floats with the wide, sharp edge. A patch is dressed the way a concrete finisher finishes a concrete slab. The direction of floating is generally away from the operator, and at right angles to the pavement center line to prevent corrugation.

"A good patch man will keep on working this float as long as the center is picking up any material," Warnock explained. "As long as the instrument is picking anything up that means there's a high place. He just dresses it down until the patch is perfectly level, and then goes over the area from all angles to make sure he has it perfect."

Warnock's men have become so particular, under his training, that frequently you see a float man pick up half a handful of material and sprinkle it delicately into a place that's just a fraction low.

For those maintenance men who ask "Isn't that kind of care expensive?" Warnock answers: the smoothest patch you can put on is the least expensive. It will last longer—indefinitely, in fact—and give real riding comfort.

Warnock's road system is for the most part a caliche base, with an asphalt or oil-asphalt penetration treatment.

Billings Has Graded Earth

While John Billings has 68 miles of paved road, he also has 100 miles of graded earth through some bad mountainous country. He has four motor graders, four dump trucks, and the kind of equipment that will dress a graded road down in fine shape. Once each month he tries to have equipment grade every mile of road in his district. Grading of earth roads is a "must" after every rain or snow.

Billings says he is sometimes referred to as a damned old fuss-budget. The principal reason for that kind of remark is also the result of a lot of experience: Billings has found how a clean, orderly yard and warehouse will promote the overall efficiency of a maintenance crew. So he has sponsored several innovations in the manner of keeping supplies and tools in tiptop condition.

He made a toolboard for all his small tools, and painted it black. Then underneath the hammer or saw or brace and bit on the board, he painted its outline in aluminum.

"I like to check the tools out," Billings said. "Then the minute I open this door, and see that aluminum paint outline, I know it's time to start hunting that tool. And the time to start hunting it is *then*, not after a while.

"A maintenance foreman can very

(*Continued on next page*)

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BARCO

Barco is the accepted tool on thousands of hurry-up jobs all over the world. Foremen know that a worker gets powerful muscles of steel when you team him with a Barco Portable Gasoline Hammer. He works harder and faster with this tireless tool. The toughest going—even in hard-to-reach spots—becomes easy. Eleven special attachments make a Barco useful on dozens of *different* jobs.

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Two Maintenance Men Talk Things Over for Us

(Continued from preceding page)

easily double his salary cost to a state or county if he isn't very careful about small tools."

Billings also had a highway-sign rack made, to hold highway markers rigid and slightly apart from each other. He uses a 2 x 4 along the back of the rack with ¼-inch saw marks cut ¼ inch deep, and about ½ inch apart. The metal markers slide into these slots and are held perfectly true, where they cannot rub and damage their paint.

He keeps his small tools apart from his signs and other small supplies to make an inventory check easier for state auditors who come around from time to time.

Out in the storage yard, things are arranged in beautiful order. Guard posts are cross-stacked neatly. Equipment not in use at the moment is stored in a line, with enough room between each piece for traveling mechanics from the Pecos district shop to work if necessary. The excellent order in Billings' yard does not mean that Warnock's is not up to the same good standard. It does mean that Billings is constantly searching for a way to add to the order and attractive appearance of the place.

Maintenance Headquarters

The two men have headquarters offices and storage yards side by side. Their headquarters are a tin building 30 x 75 feet, set near the front of a 280 x 150-foot lot. They have a 300-foot well, with a common windmill and storage tank for water.

The grounds are well kept. Billings hauled some rich earth to build a flower bed for fifty rose bushes. And the front of that yard is a galaxy of beauty in the summer.

Maintenance Now Important

Both men can recall the old rivalry between construction and maintenance men. In the old days maintenance started when a job was finished, but now the maintenance men have succeeded in getting a great deal of maintenance put into original construction.

There was a day when maintenance crews had to set all guard posts and guard rails. They had to build dikes to protect roadside ditches from serious erosion. They had to rubble-face the earth embankments around bridge walls. Much of that work is now a part of state highway plans when the jobs are let.

The maintenance men are proud of whatever part they have played in getting these items put on the construction plans.

"We got to needling the resident engineers," they explained. "We'd tell 'em to hurry on up and finish that project so we could start our maintenance. Well, the resident engineers would back us in a corner for details, and we'd give 'em details. By and by they got around to seeing that we were right.

"They may have made recommendations on the strength of what we told 'em about our work and methods. And the recommendations may have been developed in the state or district offices, too. We don't know. But we do know that Texas is cutting out a lot of maintenance by putting much of that work in the contracts."

A new construction contract is currently under way in Billings' district, and his relations with the resident engineer are exceptionally fine.

Billings and Warnock, too, work together quite closely. They trade and lend each other their equipment, their men, and any materials they may have. While the ordinary working day is 8 hours, 6 days a week, you cannot see either of these men by going to his office at 8 a.m. When the CONTRACTORS AND ENGINEERS MONTHLY Western Editor visited them, he got out of bed at 6 a.m. and caught the tail-end truck leaving the yard at 6:30 a.m. Men were out on the highways and working by the time the sun came up.

C. & E. M. Photo

John M. Billings, Maintenance Foreman at Fort Stockton, Texas, opens the door to his oil house during an inspection tour at his clean, orderly storage yard. Notice the guard posts cross-stacked so neatly.

Maintenance Life Interesting

While these two men drive sometimes 6,000 miles a month over lonely highways, their lives are full of odd experiences. Warnock's men have rescued

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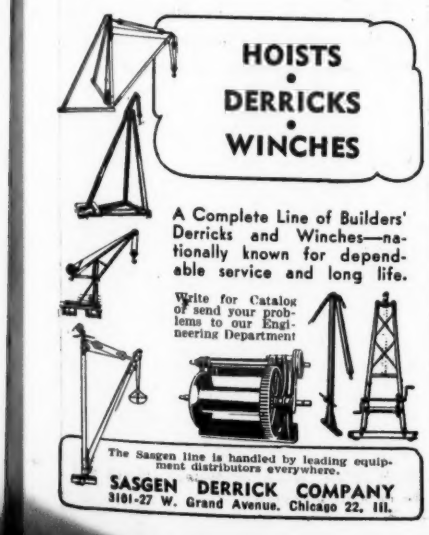

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Writes War Veteran Grant Sims

Here's a fellow who really knows truck engines. Official of an important motor freight line before the war, he spent 35 months overseas in command of a GMC-equipped mobile aircraft salvage unit. Today he is Superintendent of Maintenance for the Salt Lake Transfer Company.

"Those GMC military trucks with the '270' engine never let us down," Sims declares, "and I can say the same for the GMC commercial models we're using today. We have some pretty tough hauling in the inter-mountain region and the records show that GMC engines are most economical and reliable, requiring minimum maintenance."

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GMC TRUCKS

THE TRUCK OF VALUE

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Two Maintenance Men Talk Things Over for Us

(*Continued from preceding page*)

more than one snowbound automobile, and towed it to warmth and safety. Billings can also tell some tall tales.

"Floods in this country are pretty bad, sometimes," he said. "One morning I started out to see my crew, working on the far side of a creek bed. I figured the water might be up, but when I got down there the creek was nearly 3 feet high on the flood gage.

"I was standing there making up my mind whether I could yell across to the boys, when a Model A Ford raced past and hit the water before I could stop its driver. A woman and baby were sittin' alongside him, and when they got a little better than halfway across, the current caught the car.

"Well, it started to swap ends. It was pretty close to the far shore, and I yelled at my boys to go and get those people. Every man jumped in the water. They held that automobile from turning over, and managed to shove it out to solid ground. The man showed us a telegram he had, saying his mother was bad sick north of here, and I guess he just lost his head."

The maintenance crew changed the oil in the car, started it up, and sent the people on their way.

These two old-timers were asked the secret of the good smooth roads they have—even the 100 miles of earth. Their answer might well be the key to success in any maintenance department. They summed it up, "Work early, work late, and work constantly to a purpose!"

Self-Propelled Arc Welder

A bulletin describing its Weldmobile is free for the asking from The Hobart Brothers Co., Hobart Square, Troy, Ohio. It is a self-propelled gasoline-engine-driven arc welder, available with pneumatic tires or rail-type wheels.

The catalog contains photographs of both types of chassis and of the unit in use. Multi-range control and remote control, features of the welder, are described, also the unit's use of the same gasoline engine for welding and transportation.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 64.

Material-Spreader Data

A broadside describing its Model R. T. spreader is now being distributed by The All-Purpose Spreader Co., Fuller Road, Elyria, Ohio. The broadside contains front, rear, and end views of the unit as well as an explanation of how it works. Five features are listed together with complete specifications. Other topics covered are control of spread, width of spread, the elimination of plugging or clogging, the truck hitch, and the differential wheel action.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 68.

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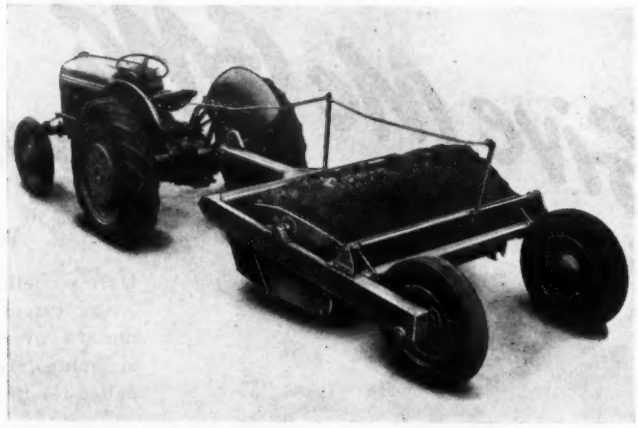
will give you
UP to 11 MPH LOADED
(Higher Speeds with Step-Up Transmission)



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- Building Reservoirs
- . . . and many other uses.

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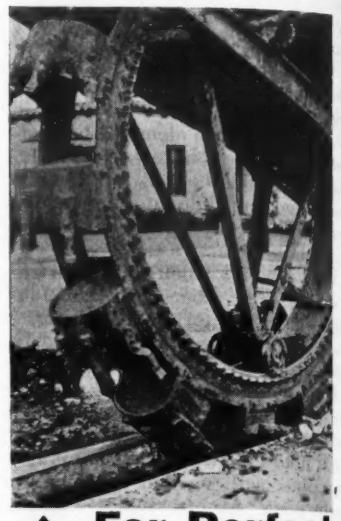

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Salt Tablet Dispenser, 500 tablet capacity, extra $2.75
Adjustable, Waterproof *Carrying Strap*, extra $1.15
Spill Cup, to catch overflow when used indoors $3.50
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Soils Studies Serve Subgrade Stabilization

ARBA Committee Asks All 48 States How They Classify and Test Soils; How They Compact, Drain, and Treat Subgrades for Pumping and Frost

✦ SURVEYS on rigid pavements in service for a number of years show rather conclusively that performance depends first of all upon adequate subgrade support and drainage. During the past fifteen years highway engineers have increasingly realized the importance of soils and drainage. And practically all state highway departments now have some facilities for evaluating soils.

Soil, climatic, and traffic conditions vary not only from state to state but also within a given state. Because of this variation subgrade soil practices cannot be standardized throughout the country. However, they have been tabulated by the Committee on Rigid Pavement Design of the American Road Builders' Association. The information gathered is of interest.

The questions asked the 48 state highway departments and the District of Columbia were designed to obtain information on the following subjects: (1) facilities available and number of employees in soils work; (2) method of soil classification; (3) soil-survey practices; (4) compaction-control methods for embankments and subgrades; (5) subgrade soil problems and treatments employed; (6) grading requirements for backfill material around subgrade drains and French drains; and (7) soil strength or stability tests for design purposes.

Laboratories, Classification Methods

All but three state highway departments now have a central soils laboratory. Vermont reports none, but relatively deep field borings are made for all projects. And since there is an abundance of glacial gravels, a gravel sub-base 12 to 24 inches thick is employed under all pavement types. While data are not available on the number of departments which had soils laboratories ten years ago, it is believed that some of the present ones have been established within this period.

As might be expected, the number of employees devoting full time to soils work varies from one or two in some states to as many as 135 in New York State. It is estimated that approximately 650 employees are now devoting full time to soils work in the 49 agencies reporting.

Approximately 150 field soil laboratories have been established by 24 agencies, either at district or division headquarters. Some states have trailer or portable field laboratories. Others do all soils testing at a central laboratory.

The method of soil classification varies with the different states. Most states (38) use the Public Roads Administration method or some modification to meet local conditions. The survey revealed that 5 states are now using the Group Index or Highway Research Board method for classifying subgrades and granular material. Nine states are making use of the pedological system, primarily as a means of identifying the soils, determining problems to be encountered, and for preliminary work. However, Michigan has used this system extensively, having started a study of the engineering significance of soil types in 1925. It has published an elaborate soils manual describing the soils and giving definite design and construction recommendations.

Several states, including Georgia, Maryland, Mississippi, New Hampshire, and Ohio, use a modification of the PRA system. Three use the California bearing ratio test as a method of classifying subgrade soils. Likewise, 3 use the Corps of Engineers or Casagrande classification. Other states classify the soils according to texture, or use a system particularly applicable to local conditions.

Soil Surveys

Twenty states follow AASHO method T86-42 for making soil surveys and 16 others use this method in part or with some modification. Twelve do not make soil surveys. County agricultural soil-survey maps and reports are utilized by 28 state highway departments. Kansas says of them, "They aid in determining the number of samples, location of special borrow, the identification of soil series, and evaluating the soils encountered for use in various portions of the structure." Others emphasized that these maps are used in preliminary studies.

Eight states indicated that some use has been made of aerial photographs in the identification or location of soil areas. Ohio reports that they have been used in locating granular deposits and that the department now has its own aerial photographic facilities. Twenty-eight states report the making of complete soil profiles for each concrete pavement project, while others profile only certain projects or those areas where difficulties are anticipated.

Embankment Compaction

The compaction of embankments and subgrades is an item to which highway departments have given increased attention in recent years. The survey revealed that 36 states now specify some type of control procedures for it. The majority (23) specify Proctor compaction (AASHO T99), although some specify Modified Proctor. A minimum number of passes of the roller ranging from 4 to 15, is specified by 7 states. The maximum thickness of layers for soil embankments ranges from 4 to 12 inches and averages about 8 inches. The percentage of compaction required varies with the tests specified; however, many states specify AASHO M57-42, which is a range of 90 to 100 per cent. One state reported a specification of 85 per cent compaction on secondary roads and 90 per cent on primary highways.

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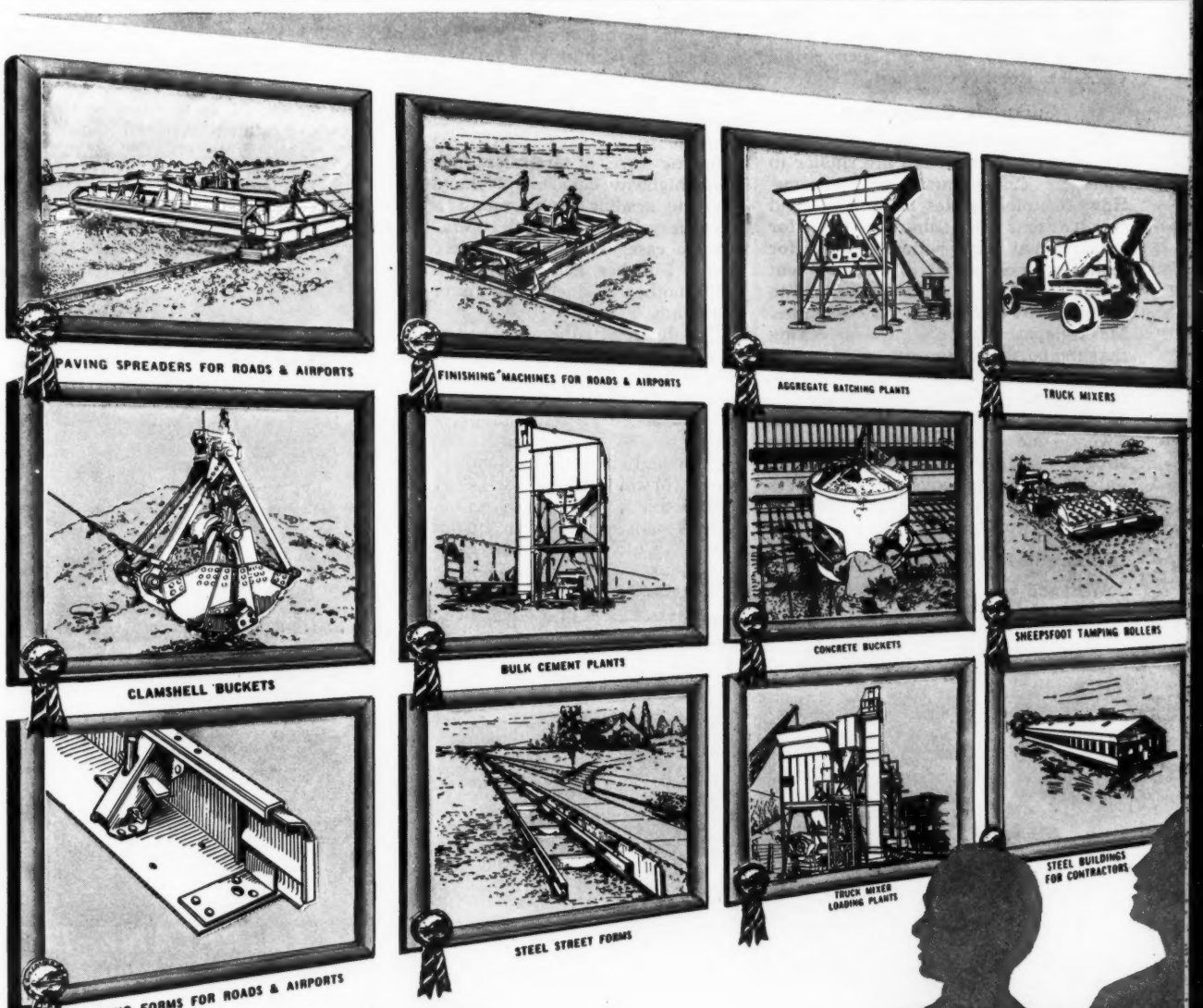

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BLAW-KNOX CONSTRUCTION EQUIPMENT

Soils Studies Serve Subgrade Stabilization

(*Continued from preceding page*)

Two states, California and Massachusetts, specify the amount of rolling equipment. For example, California requires one three-wheel roller or one 8-foot width of sheepsfoot roller for each 150 cubic yards of embankment placed per hour. Massachusetts specifies that at least one power or tamping roller shall be provided and in constant use for each 100 cubic yards or fraction thereof of embankment material placed per hour. An optimum moisture content is specified by 20 highway departments. Some permit a variation from optimum, usually 2 per cent, while other states indicate no permissible variation from optimum.

Subgrade Compaction

For 27 departments the specifications for subgrade compaction are similar to those for embankments or the same. However, other states have more rigid requirements for subgrade than for embankment compaction. Ohio, for example, specifies 90 to 102 per cent compaction for embankments and 95 to 105 per cent compaction for subgrades. Many departments are now specifying that the portion of the subgrade in cuts be scarified and recompacted to the same degree as that in embankments. The depth varies from 6 to 12 inches. Twenty-one departments compact the subgrade beyond the form width to the outside shoulder edge, while others compact only within the form lines or a foot or two beyond.

Subgrade Problems and Treatment

With the variety of soil and climatic conditions that exist throughout the country, subgrade problems and their consequent treatment will inevitably be different. Thirty-three states reported that pumping of rigid slabs is the most general problem while frost action runs a close second. In general, the frost-action problem is confined to the northern half of the United States. Numerous other problems were listed and include high-volume-change soils, organic soils, sulphate soils, poorly drained soils, settlements, and bentonite. In general the treatment for these problems consists of a blanket or insulation course of either good soil, local materials, or a well graded granular material.

If soils are utilized for subgrade treatment, most states specify that the plasticity index (P.I.) shall be low, usually 6 or less. Others specify no plasticity in the minus No. 100-mesh material. Still others require that at least 50 to 55 per cent of the soil be retained on the No. 270 sieve. Some specify limiting grading or texture requirements.

In the case of granular materials, some highway departments have very exacting grading requirements; others have very flexible specifications. As a specific case, one state permits a top size of 5 inches, another 3 inches, and still another 1-inch-maximum-size aggregate.

The depth of subgrade treatment or blanket insulation course varies considerably according to the problem and location. Some states use layers as thin as 2 inches to prevent pumping while others employ a depth up to 48 inches for prevention of frost action. Some states (Minnesota and Michigan) even indicated a variation in depth of treatment from the southern to the northern portion of the state, because of climatic conditions.

Highway engineers are apparently not in accord as to whether the subgrade-treatment material should be a relatively dense or a porous freely

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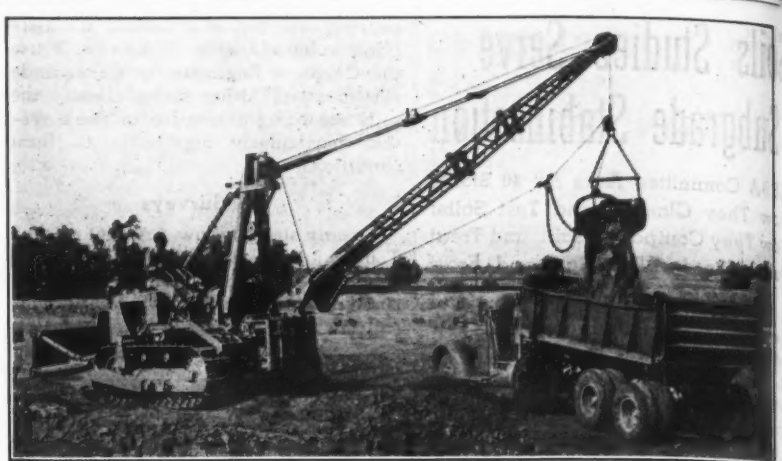

This Hystaway dragline, clamshell, and crane attachment is designed for D6 and D7 Caterpillar track-type tractors. The bulldozer can be used with the Hystaway mounted, says its manufacturer, the Hyster Co. of Portland 8, Oreg.; for full production it can be ready in an hour with removal of all but the Hystaway transmission. The combination is especially adapted to laying pipe lines. It draglines the ditch, operates as a crane to lower the pipe, and backfills with the bucket or bulldozer.

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One of the highlight features of this new trench roller is the leveling wheel which is pneumatic tired, with adjustment by powered screw-type leveling unit.

Automotive-type steering gives unmatched maneuverability, allowing 45° turning radius. Two engine types are available, either Hercules or the Willys Jeep, with two speeds forward and reverse. Every journal is carried on Timken or Bower tapered bearings and is sealed in oil.

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One highway engineer wrote, "The Cemco Flat-Iron Roller does a good job in places that would have been impossible with any other type of roller that I have seen." This pneumatic tired roller will *smooth* as well as *compact* stabilized bases, bituminous "cold lay" surfaces and seal coat aggregates. Water won't work into the soil when the Cemco Roller follows up the blading operation to *seal the dirt fills.*

It will carry a terrific weight load—128 cu. ft. of sand. This gives you a 10 ton roller when fully loaded. The low center of gravity permits work on shoulders and otherwise inaccessible places. 72" to 75" compaction path.

Roller bearing equipped, you can tow it to and from the job at 50 mph. Can even be used as a snow packer, trailer and emergency sprinkler.

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Soils Studies Serve Subgrade Stabilization

(Continued from preceding page)

drained material. It is possible that this difference of opinion results from a lack of uniformity in nomenclature. Only 16 prefer the relatively dense as compared to 38 which prefer the porous easily drained material. Some states reported that both are used—the porous easily drained material on a fine-grained subgrade soil and the relatively dense material on a cohesionless or sandy soil.

The same question was asked concerning shoulder material. In this case only 13 states prefer the relatively dense material, while 32 indicated a preference for the porous easily drained shoulder material. Many states indicated that porous subgrade-treatment material is extended throughout the shoulders. In some cases an impervious top is placed upon the shoulders.

Subgrade Drainage

Grading requirements for backfill material around drains is another item to which highway engineers have given increased attention in recent years. The replies indicated a wide range in requirements by the various departments; however, the specifications reflected the fact that considerable thought has been given to this item. It appears that findings of the U. S. Waterways Experiment Station have played an important part in a more careful consideration of filter requirements.

Twenty-three states use French drains and a few others use them only occasionally. In most cases grading requirements are the same as for backfill material around subgrade drains. It is believed that present practices are a big advancement over the practice a few years ago of using large one-size aggregates which soon became clogged and ineffective.

Strength or Stability Tests

None of the state highway departments perform field load-bearing tests on rigid-pavement subgrades for design purposes. Wisconsin engineers reasoned that bearing values of soils depend upon moisture content; that this varies with meteorological conditions not only between seasons but between the same seasons in different years; and therefore, that field bearing tests at any time are apt to be misleading. It is their belief that rigid-pavement performance depends to a greater extent upon uniformity of bearing power than upon its specific value.

Laboratory strength or stability tests on subgrade soils for rigid pavements are performed by 21 states. Thirteen of these report the use of the California bearing ratio test, while others use a modification of this test, or shear, unconfined compression, or trial-axial tests. Fifteen states indicated that these tests are used as a basis for the design of rigid pavements; however, most states did not give minimum design requirements. Some stated that the tests are used as a check only. Others reported that a standard thickness of pavement is used and that where necessary the subgrade is reinforced to bring it to the proper supporting value for the thickness employed.

From the report of the Committee on Rigid Pavement Design, presented by Tilton E. Shelburne at the 44th Annual Convention of the American Road Builders' Association.

Submersible Pumps

A new 12-page bulletin has just been released by the Pump Division of Byron Jackson Co., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif. Bulletin No. 46-5000 describes the BJ deep-well turbine pump and electric-motor unit. It is claimed that this pump unit will operate submerged in water at any depth. Capacities range from 7,000 to 20,000 gpm, and the pump will develop heads up to 1,500 feet.

The catalog is printed and illustrated in three colors. It contains photographs, parts diagrams, and tabular data. Specifically, it covers the Type B for relatively low capacities, the Type K for general deep-well applications, and the Type R for high-capacity low-head operations. Also included are pictures of the pumps installed on various locations.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 82.

I-H Appointment, N. Y.

The appointment of O. C. Price, Jr., as Sales Promotion Manager for the New York City Sales District has been announced by the Motor Truck Division of International Harvester Co. Mr. Price will make his headquarters at 570 W. 42nd St., New York City.

TUTHILL GUARD, with its convex surface and spring brackets, is safer, for two reasons. It can be seen quicker at longer distances. Its deflective action deflects cars back into highway and absorbs impact. Result—more lives saved—less damage to car and guard rail. Low upkeep cost. Request Details

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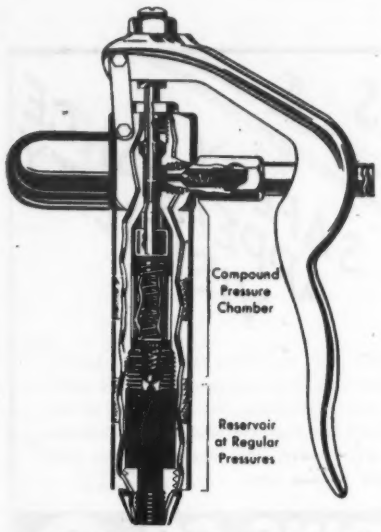


This booster control valve made by Universal Lubricating Systems is said to double pressures for lubricating by a squeeze on the control handle.

Control Valve Ups Grease Pressures

A booster control valve said to double grease pressures for lubricating automotive and similar equipment is made by Universal Lubricating Systems, Inc., Oakmont, Pa. The first squeeze of the control valve handle gives regular line pressure. When greater pressure is required, a second and third squeeze on the control handle is said to give the increased pressure through Universal's compounding action. Pressure is increased in the control valve and at the fitting, not in the hose line.

The valve is available in five models, all of aluminum and hardened-steel construction, and varying only in the type of coupler or swivel used.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 36.

Apron Feeder Made Of New Steel Alloy

A new apron feeder for handling quarry rock and similar materials has been announced by Pioneer Engineering Works, Inc., 1515 Central Ave., Minneapolis 13, Minn. All wearing parts of the feeder are made from Oro Supermang steel, a new type of manganese steel patented by Kensington Steel Co. of Chicago.

The apron consists of a series of Oro Supermang double-beaded overlapping and interlocking pans with vertical reinforced side flanges. The undersides of the pans are heavily ribbed, and the design of the side flanges is said to reduce the leakage of fines to a minimum. The links, cast as part of the pans, serve as chain links and present a continuous flat surface for carrying the apron over a series of rollers. This type of construction eliminates bolted attachments, the manufacturer points out.

Sprockets are built with reversible and renewable Supermang teeth. Alemite fittings serve to lubricate the heavy shafts which turn in heavy-type angle pillow blocks. The Pioneer-Oro manganese feeder can be secured in pan widths from 36 to 48 inches, and in lengths from 6 feet 3 inches to 16 feet 9 inches, measured from shaft center lines.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 46.

AL&T Co. Moves Bartlett

The transfer of L. E. Bartlett from New York to its central district sales staff in Chicago has been announced by the American Lumber & Treating Co. He will be engaged in the sales of Wolmanized, creosoted, and Minalith flameproofed lumber in the mid-west, southwest, and south-central states.

Law to Permit Overtime Speeds N.Y. Road Program

It is expected that the $800,000,000 highway construction program for New York State will be greatly speeded up by Governor Dewey's approval of the Ostrander bill. The measure is designed to permit an exception to the state constitutional provision limiting employment on state public works to 8 hours per day and 5 days per week.

Because of these limitations upon hours of employment, contractors have been unable to obtain enough help; workers have preferred to work on Federal and private projects where they could receive overtime pay. The new law permits the industrial commissioner, in connection with public works projects for which insufficient labor is available, to declare an extraordinary emergency permitting employees to work more than the present maximums established by law provided a premium wage is paid for the excess working time.

The emergency ruling will be based on the fact that the contract site would be jeopardized and life and limb endangered by delaying the work.

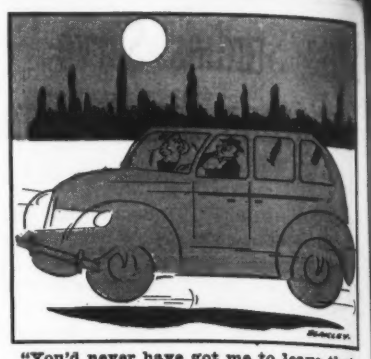
A special dispensation for overtime hours will be determined for each particular project and will be determined by existing labor supply at the job site. The dispensation can be revoked upon five days' notice to the contractor.

Steam-Generator Catalog

A recently published catalog listing its line of steam generators is now being distributed by the Preferred Utilities Mfg. Corp., 1860 Broadway, New York 23, N. Y. Bulletin No. 1000-E is a two-color 8-page description of the Preferred unit steam generators. Oil-fired, of the four-pass induced-draft type, they range in size from 40 to 500 hp; in the two-pass model they are made in 10, 20, and 30-hp sizes.

The bulletin lists features of operation and construction, describes standard and auxiliary equipment, and contains two graphs on typical boiler performance for high-pressure units. The last page is devoted to complete data and dimensions of all the four-pass styles and sizes.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 73.



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+ MORE than 5,500 square yards or 2,500 linear feet of 7-inch concrete pavement was poured daily for a 20-foot highway wearing surface in western Wisconsin last autumn, as the contractor stepped up operations to beat the freeze.

The contract replaces the old bituminous surfacing on U. S. 8 for 9.7 miles east from St. Croix Falls. Work on it was speeded up with two finishing machines which reduced the amount of slow hand labor. And a crushing plant contributed to the general high-speed, smoothly functioning operations; it turned out aggregate in three sizes and stockpiled material about three days in advance of the daily paver requirements.

The contract for the project was awarded by the State Highway Commission of Wisconsin to Victor Nelson of Superior, who submitted a low bid of $317,117. The project involved, in addition to 114,200 square yards of concrete paving, some 104,800 cubic yards of sand-gravel fill over the old roadway. Although the contract was awarded early in the 1946 construction season, the contractor did not start initial work on the job until late in July. It was not until September 3 that the first pour was made. But once work was actually started on the new slab, no time was wasted.

Preparation

Initial step in preparing the grade for new concrete pavement was removal of the black-top. This was scarified with a Caterpillar No. 12 motor grader and rolled off the highway by a Caterpillar 75 with a LeTourneau 12-yard scraper. The 104,800 cubic yards of sand fill required on the grade was brought in by scraper from side borrow and compacted on the roadbed. Then the black-top which had been removed was moved back on the highway to provide a protective surface for batch trucks to operate over during hauls to the paver.

The motor grader saw subsequent service shaping the grade. And the scraper and tractor, which was also equipped with a bulldozer, were used for shouldering and stripping the gravel pit.

As work went ahead on the old road in preparation for paving, washing and crushing units were being installed in a pit near the middle of the job with an average haul over the entire project of 6 miles from pit to highway. This pit furnished all aggregate including sand, ¾-inch crushed rock, and 1½-inch crushed rock used in the mix.

Gravel Pit

Prime producer in the pit was a Pioneer 300 W washing and crushing plant with a 40 x 22 roll crusher and a 15 x 36 primary. A 10-inch trap was used with the plant.

In the pit, a Koehring 301 ¾-yard shovel loaded to two 5-yard dump trucks which averaged a round trip every 5 minutes from the shovel to the trap. Material from the pit was conveyed to the plant. Running 20 hours a day, the crusher turned out a daily average of 1,800 tons of sand, ¾-inch

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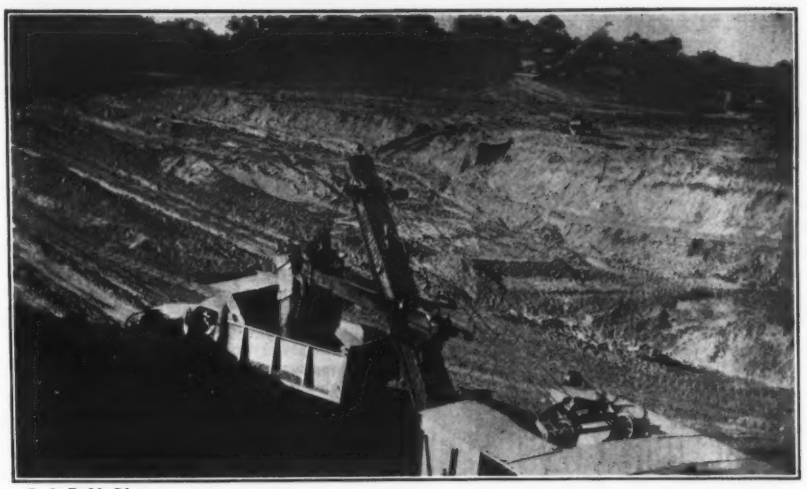

C. & E. M. Photo
On the Victor Nelson paving job, a Koehring 301 ¾-yard shovel in the pit loads a dump truck with aggregate for transport to the Pioneer washing and crushing plant which can be seen in the background.

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2-Ton "Lightweight"	75 ft.	½"
5-Ton "General Utility"	250 ft.	⅞"
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With patent gear change and positive internal brake that never fails, and will lock load.

Gear Ratios	Weight	Price
2-Ton 4 & 22 to 1	60 lb.	$ 70
5-Ton 4 & 24 to 1	110 lb.	90
15-Ton 4, 19 & 109 to 1	680 lb.	350

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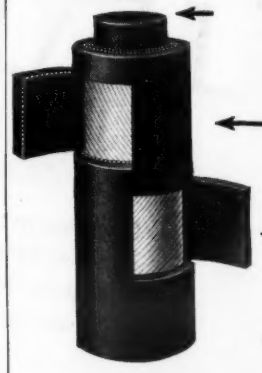

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This Pioneer 300 W screening, crushing, and washing plant turned out a daily average of 1,800 tons of three sizes of aggregate on a Wisconsin paving job. It kept well ahead of daily paver requirements.

Paver Did 2,500 Feet Daily on Concrete Road

(Continued from preceding page)

aggregate, and 1½-inch aggregate.

The washing and crushing unit was powered by a Caterpillar D13000 diesel. A 45-foot conveyor carried material to the primary crusher, and a 75-foot conveyor carried the aggregate to the secondary. Three conveyors handled the discharge from the plant: a 35-foot conveyor carried the sand; a 35-foot conveyor carried the ¾-inch crushed rock; and a 45-foot conveyor handled the 1½-inch material.

Sand and crushed rock from the washing and crushing plant were stockpiled well ahead of daily paver requirements. A Koehring 501 1¼-yard crane loaded from the stockpiles to Johnson 55-yard bins. These were equipped with Johnson hopper scales for weighing out the batches to the haul trucks.

The gravel pit was located near the shore of Deer Lake, and water for the washing plant was pumped with a Fairbanks-Morse pump and Waukesha motor through a 6-inch line to the washer. Screening, crushing, and washing were run as one continuous operation.

Bulk cement, stored in bins made by the contractor, was hauled from the nearest railroad siding for 3½ miles to the pit. Scales at the bins weighed out the cement to the trucks at the rate of 703 pounds per batch.

About twenty 6-yard rented dump trucks hauled two batches each for the average 6-mile haul from the pit and batch plant to the job. Over most of the job, the trucks were able to average two trips per hour.

The crew at the pit included a crusher operator, an oiler, one trapman, a shovel runner, a crane operator, and two or three cement handlers at the cement bin. Two truck drivers shunted betwen the shovel and trap. Operations at the pit were in charge of Oscar Lindstrom of Superior about whom, in his capacity as Master Mechanic, more will be said later.

Fine-Grading

On the roadway the fine-grade crew and fine-grading equipment kept a good 1,000 feet ahead of the paver. Well ahead of the equipment were three men on each side of the road who did the side grading and form grading by hand. They were followed by four men on each side of the road who laid the 3,000 road-feet or 6,000 total footage of Metaform road forms by hand.

Fine-grade equipment consisted of a Caterpillar D8 tractor with an Ateco scraper; a Caterpillar No. 12 motor grader and a Carr subgrader which was lowered on the road forms and pulled by the Caterpillar; and a Carr subgrade finisher attached to the paver.

The Metaform road forms were lubricated by hand just ahead of the mixer with Standard Oil Co.'s black oil and the forms were pulled everyday.

Paving

Dry batches were hauled to the paver in the 20 rented 6-yard dump trucks, each of which carried two batches of 3 yards. The following comprised the batch of about 34 cubic feet of concrete:

Cement	703	lbs.
Sand	1,773	lbs.
Gravel, ¾-inch	1,167	lbs.
Gravel, 1½-inch	1,743	lbs.
Water	44.88	gals.

Water for the concrete was piped a maximum of 3 miles through 2½-inch and 2-inch pipe and pumped from lakes and streams with a C.H. & E. and a Barnes Model 35 triplex pump. Air-entraining cement was used on the job, with the air-entraining agent interground into the cement at the mill. Air-entrained concrete is being used in increasing quantities in the northern states, where tests indicate it is more resistant to the rigors of freezing and thawing than ordinary concrete and not as likely to scale, even under chemical action.

The paver which turned in the good daily average of 2,500 linear feet for each 12-hour run was a new Koehring 34-E dual-drum paver. It was followed by two Jaeger-Lakewood finishing machines. Arthur Peterson, Construction Superintendent for the contractor, explained that the use of two finishing machines immediately following materially reduced the amount of hand labor for finishing the slab.

The second finishing machine was followed by a Koehring Longitudinal Finisher and then by a joint cutter

(Concluded on next page)

C. & E. M. Photo

The bucket of this Koehring 34-E dual-drum paver goes out with its 34-cubic-foot load of concrete for the Victor Nelson 9.7-mile contract near St. Croix Falls, Wis. In the immediate background is the first of two Jaeger-Lakewood finishing machines used.

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PORTABLE CONVEYORS

★ Cargo Conveyors for Industrial Use
★ Troughing Conveyors for Loose Materials
★ "Coal Special" Type
★ "Motomove" Self-Propelled Conveyors

FOR TIME AND LABOR SAVING

Flexible... Adaptable... Relatively Inexpensive... Conveyors as Haiss builds them are the logical answer where man-shortages make each workman's labor precious.... Haiss Portable Conveyors are *engineered* jobs, with loads carried on high-grade ball and roller bearings. Frames are truss-designed for strength without excess weight.

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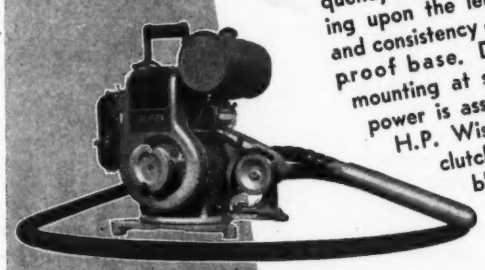
JACKSON MODEL FS-6A

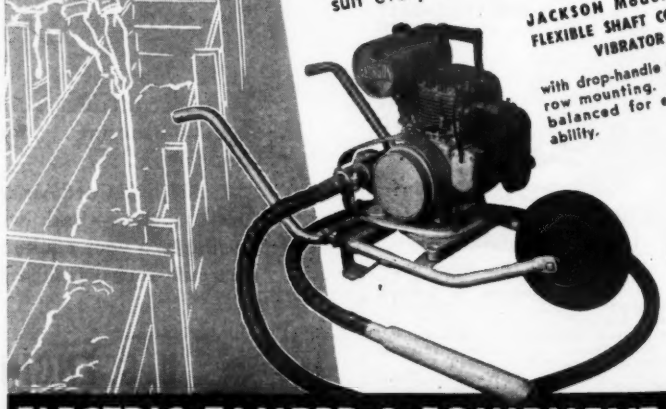
for THOROUGH, EFFICIENT VIBRATION of CONCRETE ANYWHERE — ANY TIME on a WIDE VARIETY of JOBS!

With this thoroughly proved, highly dependable engine-driven flexible shaft vibrator you are all set at a moment's notice to do a perfect job of concrete vibrating on a large variety of jobs, and to effect very appreciable labor and cement savings as well as achieving better quality in the finished product.

It is available with four interchangeable heads ranging from 1¾" x 10¾" to 2⅜" x 18⅝"; and since the vibrator speed may be quickly and positively adjusted, size of head and amplitude may be perfectly balanced to suit each type of job. Top frequency is from 7,000 to 7,500 VPM depending upon the length of flexible shaft used and consistency of concrete. Full swivel, dirt-proof base. Drop-handle wheelbarrow mounting at small extra cost. Plenty of power is assured by the dependable 4 H.P. Wisconsin engine. Automatic clutch saves engine wear. Flexible shaft is furnished in 7', and 14' lengths up to 28'. Equipped with new and improved reduction pulley for driving grinding heads most efficiently for wet or dry rubbing. See the FS-6A and the other highly efficient JACKSON Vibrators at your JACKSON Distributor or write for complete details. There's a JACKSON to ideally suit every concrete vibrating requirement.



In this view of the Model FS-6A note the two speed pulleys for most efficient shaft speeds for operation of vibrator and grinder heads.



JACKSON Model FS-6A FLEXIBLE SHAFT CONCRETE VIBRATOR with drop-handle wheelbarrow mounting. Perfectly balanced for easy portability.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

C. & E. M. Photo

An International truck with a high-pressure greasing outfit lubricated Nelson equipment every 10 or 24 hours right on the job. Here Ed Neman of Superior, Wis., "high-pressures" a new Caterpillar No. 12 motor grader.

Paver Did 2,500 Feet Daily on Concrete Road

(Continued from preceding page)

which the contractor built. The paving crew which followed the joint cutter included 2 straight-edge men, 4 joint pullers, and 4 hand finishers.

The slab was cured under Sisalkraft paper for 72 hours. Afterwards the paper was re-rolled and hauled down the highway for re-use on a rubber-tired trailer pulled by a Caterpillar D4. This same unit was also used for hauling the Metaform road forms.

Equipment Maintenance

A necessary adjunct of this large paving project involving many heavy units of equipment was a complete field repair shop. Under the direction of Master Mechanic Oscar Lindstrom and his three assistants, a field shop was set up at the gravel pit for maintaining and repairing the machines. Equipment at the disposal of the mechanics included a blacksmith shop, Westinghouse Flexarc welder, gas-welding equipment, and small tools.

This equipment sufficed to handle all but the major repairs which required the facilities of a permanent machine shop. But Victor Nelson values his construction equipment too highly to stress only repair work. A function of the mechanics just as important as repairing broken-down equipment was preventing the breakdowns.

An International truck with a high-pressure greasing outfit ably handled lubrication right on the job. A Curtis compressor with Briggs & Stratton motor shot D-A lubricants into all the hard-to-reach crevices of the equipment once every 10 or 24 hours, depending on the requirements of the unit.

As further assurance of continuous operations without costly and time-consuming breakdowns, 6 x 19 hemp-center improved plow steel preformed wire rope was used on all cable-controlled equipment. Although shortages of steel cable made it impossible always to obtain the brand of wire rope preferred, it was possible to obtain the preformed type of cable which, according to Master Mechanic Lindstrom, "stands up better and outwears ordinary rope."

Personnel

Victor Nelson employed an average of 120 men working two 10-hour shifts 6 days a week. While the crusher crews worked 20 hours a day, however, the road crew worked only 12 hours. Some of the men were quartered in five bunk cars which the contractor set up near the gravel pit, and most of the men ate at the company messroom set up adjoining the cook car near-by.

The project was constructed under the supervision of Don Joyal, Ashland, Resident Engineer for the State Highway Commission, and Arthur Peterson, Construction Superintendent for the contractor. The Master Mechanic on the job, Oscar Lindstrom, was also in charge of the gravel pit. Frank Kurth, Superior, was Paving Foreman, and Grover West, also of Superior, was Office Manager.

Caterpillar Staff Changes

C. A. Barabe, Assistant Eastern Division Sales Manager of the Caterpillar Tractor Co., Peoria, Ill., has been granted a 6-month medical leave of absence. W. N. Foster, divisional district representative, has been promoted to the assistant managership.

E. W. Jackson, General Parts Manager since 1944, has been appointed Director of Parts and Service. M. T. Deames has been promoted from Assistant General Parts Manager to General Parts Manager. And W. Blackie, Vice President and chief administrative head of the Accounting and Merchandise Departments, has also assumed administrative guidance of the Traffic Department.

J. H. Deaderick, Vice President in charge of Parts, Service, and Traffic Departments since 1943, and E. L. Murray, Credit Manager of the Treasury Department, have resigned their positions to join Fred Elder of Phoenix, Ariz., as Caterpillar distributor for the greater part of Arizona.

Frank S. Foster has been named district representative for the states of South Carolina, Tennessee, and Georgia. He takes over the territory formerly served by G. W. Bussell, who was killed in an automobile accident early this year.

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Triple-checked against the most rigid standards to assure efficient, trouble-free performance?

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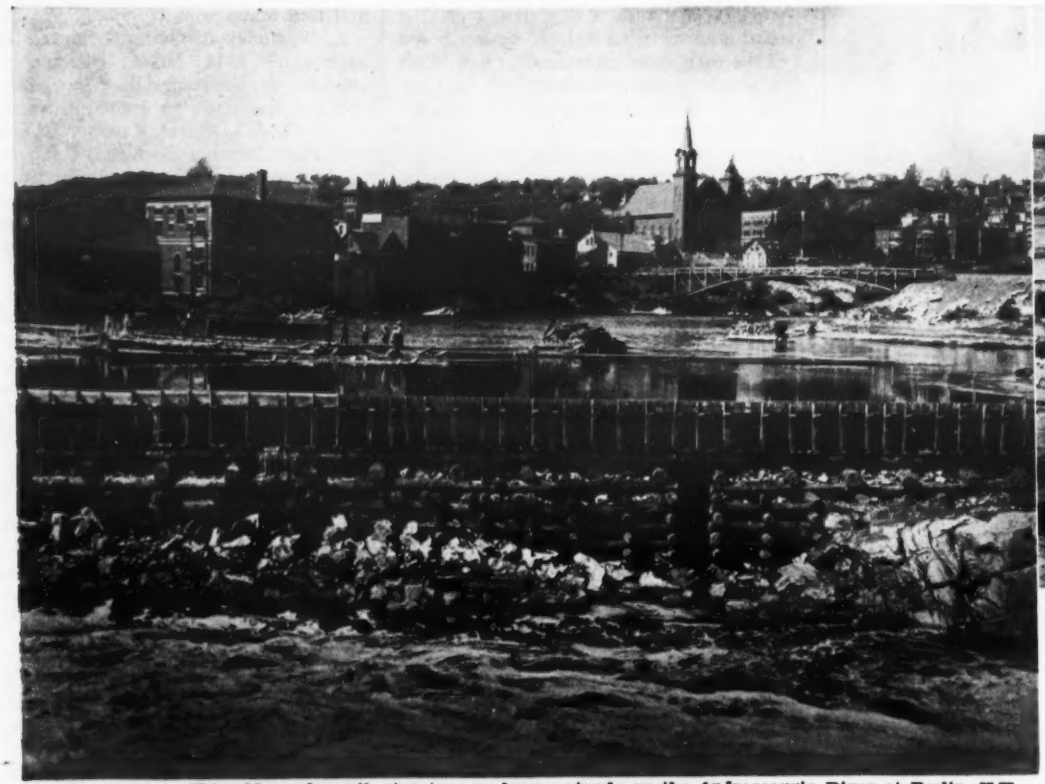
INTERNATIONAL Trucks



OLD DAM. This old wooden-crib structure no longer stands on the Androscoggin River at Berlin, N.H. About 100 feet behind it workers can be seen building a cofferdam to seal off the work area for a new concrete gravity-type dam to replace it. As described in the article on page 73 of this issue, the Public Service Co. of New Hampshire is developing a natural head of water at this point on the river for use as electrical energy. Sanders Engineering Co., Inc., of Portland, Maine, contracted for the job.

COFFERDAM. Norway pine and hemlock logs were fram[illegible]ch othe squares for the cofferdam. And, as shown he[illegible]icago P matic Power Vane wood auger drilled holes for drift pins to hold th[illegible]ogether more tiers were added, the structure sank to the river bottom wher[illegible] filled rock and chinked with fines. A crane ripped out the old dam and th[illegible] was b

New Pov

On [illegible]

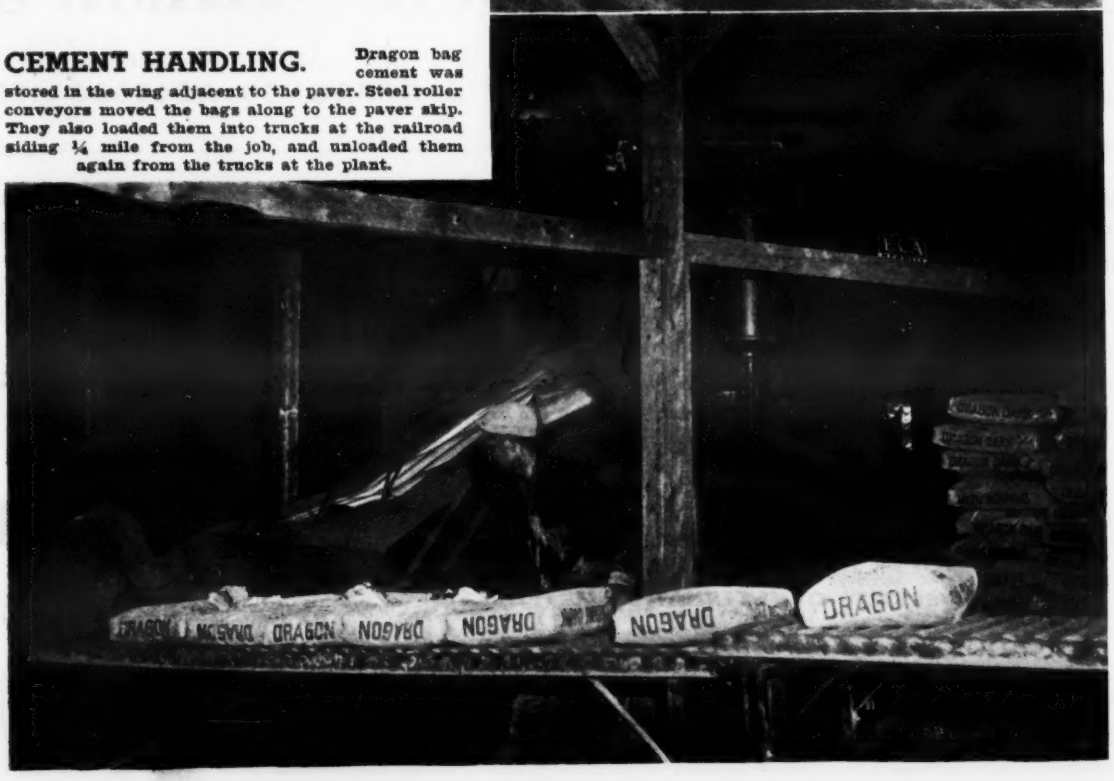
Two Dams, [illegible]wer

Spring Up[illegible] A

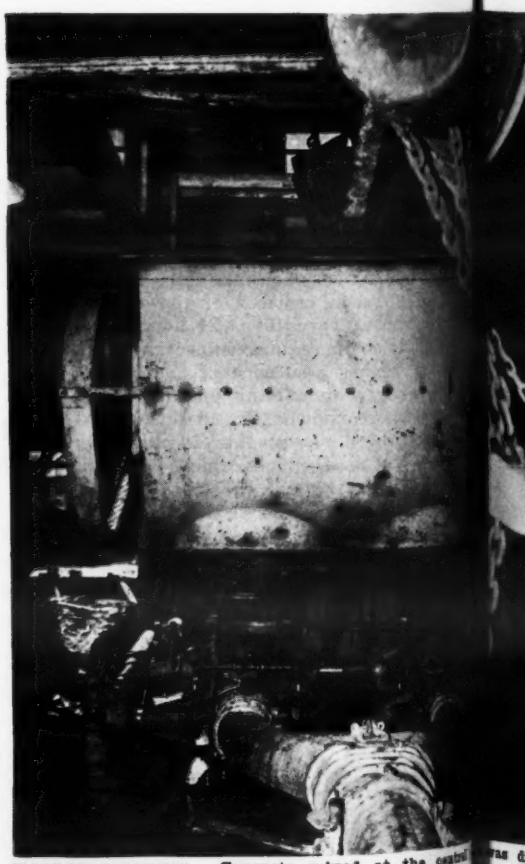
With Conc[illegible]e C

By Pumpcr[illegible]g c

BATCH PLANT. The contractor set up a central concrete batch plant near the power canal. This consisted of a Warren Brothers three-compartment aggregate bin of 125-ton capacity. Beside it stood a frame structure whose inside vertical clearance was able to accommodate the raised skip of a MultiFoote 27-E single-drum paver.



CEMENT HANDLING. Dragon bag cement was stored in the wing adjacent to the paver. Steel roller conveyors moved the bags along to the paver skip. They also loaded them into trucks at the railroad siding ¼ mile from the job, and unloaded them again from the trucks at the plant.



PUMPCRETE. Concrete mixed at the centra[illegible] charged down a chute into the [illegible]per o[illegible] Rex Model 180 Pumpcrete set up beneath the building. [illegible]e it w[illegible] pumped through a Y-connection to a 7-inch line at th[illegible]30 to cubic yards per hour, and through 1,000 feet of line to [illegible]he up end of the job. A Yale 2-ton hoist lifted out a section o[illegible] when was cleaned at the end of a day's pou[illegible]

...re fram...ch other in ...shown he...icago Pneu... ...o hold th...ogether. As ...om where ...filled with ...n and the ...e was built.

SHOVEL EXCAVATION. Meanwhile old buildings on the site, formerly part of a big paper mill, were razed to make room for a new canal and penstock which will conduct water from behind the new dam to a new powerhouse. A Bucyrus-Erie 37-B was one of two shovels which loaded Sterling 6-yard trucks with blasted masonry to be wasted near-by.

DERRICK EXCAVATION. An American 20-ton derrick, set up on the river's west bank, removed some of the rock from the new powerhouse site down in the gorge at water level. With its 115-foot mast and 110-foot boom, it was held in position by seven guys and was mounted on a bull wheel to allow full-circle swing. It was equipped with a Thomas elevator 4-drum direct-swing hoist operated by a 125-hp electric motor. The derrick will also handle heavy equipment to go into the powerhouse.

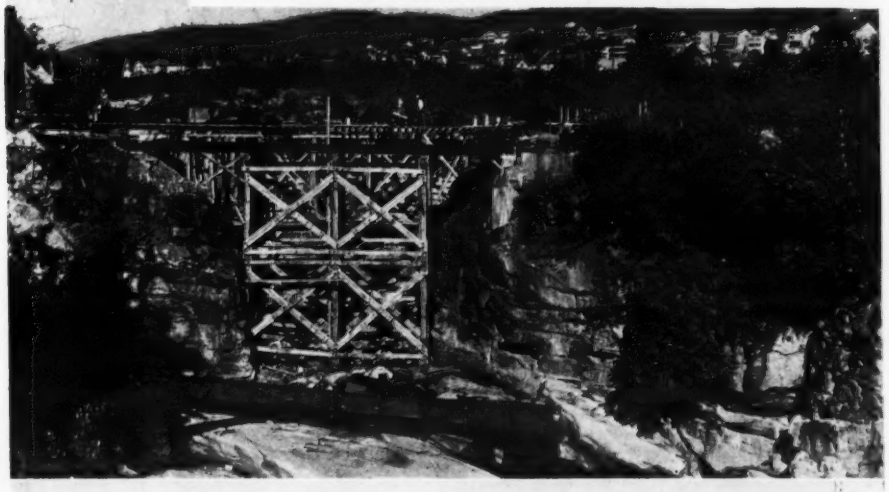
...ower Plant ...Old Mill Site

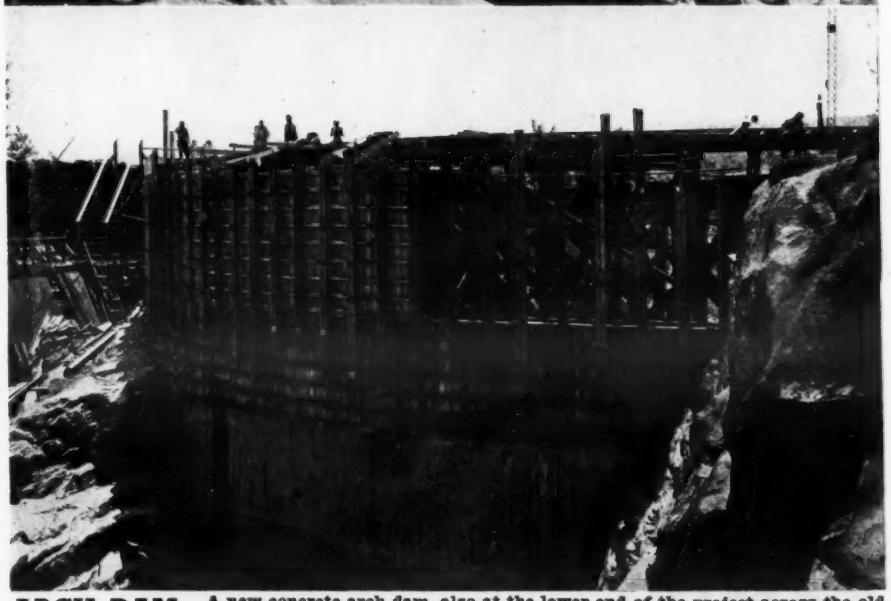
...ams, ...wer Canal, Powerhouse ...g Up...n Androscoggin River ... Conc...e Operations Marked ...npcr...g and "Indoor" Mixing

(C. & E. M. Photos)

POWER CANAL. To pour the west wall of the new power canal—against the west wall of the old canal as one side of the form—the concrete pipe line was raised on a trestle to wall height. Then it was brought along on top of the old wall where it emptied into the forms through a hopper and elephant-trunk pipe. A Jaeger 2-inch pump unwatered the sandbag cofferdam which was placed around the bottom of the wall forms.

WORK BRIDGE. For direct access to operations on the other side of the river, the contractor threw a work bridge across the old channel at the lower end of the project. It was built of wooden trestles with steel I-beam stringers taken from the razed mill buildings. Its deck was 14 feet wide.





ARCH DAM. A new concrete arch dam, also at the lower end of the project across the old channel, was constructed to keep any possible flood from sweeping down through the canal, over the penstock, and into the powerhouse. Concrete for it was mixed in a paver on the bank of the gorge with batches hauled down from the central plant. Then it was discharged into cars to be pushed out over a trestle and side-dumped into the forms. The dam is 100 feet long on top, 40 feet high, and is built on a 50-foot radius. The entire project is expected to be completed and power on the line by next autumn.

All Set to Road-Mix, Then the Rains Came

Aggregate Drying Becomes Contractor's Big Problem On 12-Mile Surfacing Job; Cussing of No Avail

(Photo on page 1)

✦ THE rains can come in flat Nebraska, U. S. A., as well as in India or Tahiti. They may not pour down by bucketfuls through soaked palm fronds. But they can sift down day after day from overcast August skies. Innocent little drizzles—not heavy enough to help the farmer, but persistent enough to drown you before you know you're damp, and insidious enough to fray a highway contractor's nerves.

Ask the Inland Construction Co. of Omaha, Nebr. Ask about that contract with the Nebraska Department of Roads and Irrigation for State Highway No. 3, some 10 miles west of Beatrice. Ask what the rain did to windrows of road-mix aggregate that August in 1946, when specifications read: "hold moisture under 3 per cent"!

The rain had prevailed from June 3 when the company started its 12-mile job with 67 days of working time, until August when the job was visited for CONTRACTORS AND ENGINEERS MONTHLY. Damp weather was still slowing down the evaporation of moisture and preventing the aeration of cut-back asphalt used for a binder. Good equipment, a well organized job plan, and capable help and cooperation from the State meant nothing when days went by without the sun.

The Old Road

The old road was built in 1937. Its base was compacted and it was covered with an armor coating 28 feet wide. Many places in this armor coating developed spotty holes. Entire sections eventually failed. Heavy traffic between Beatrice and Fairbury accelerated the destruction. Up to 1946 the State had put more than twenty large concrete patches on the road. Other places needed patching but had not been repaired when the contract was awarded.

Inland Construction Co. filled the places needing immediate attention with 1½-inch maximum-size crushed rock. This was furnished by the State. It was hauled by dump trucks from Wymore, dumped in place, and smoothed by motor graders. Two pneumatic rollers compacted the patches. A 2-inch layer of old bituminous armor coating which the State had laid over the concrete patches was skinned off, made workable by a few shots of diesel fuel, and rolled down on top of the rock. No less than 39 large patches had to be made before work could really start on road-mixing.

Hauling and Processing Aggregate

Mineral aggregate for the job came mostly from a natural deposit of rounded alluvium in a dry pit about 8 miles from the center of the job. It was loaded to Insley 8-cubic-yard dump wagons. Two laborers helped around the dragline, picking out large rock, clay balls, and other debris. Ten 8-yard dump trucks and four 5-yard dump trucks were also rented on a yard-mile basis, and used partly on this haul.

The mineral aggregate was unusually fine, but state specifications called for the addition of No. 100 and No. 200

(*Continued on next page*)

C. & E. M. Photo
Mixing a 29-ton windrow, this Barber-Greene machine crawled steadily ahead at an average of 400 feet an hour on the Inland Construction Co. job near Beatrice, Nebr.

ESCO 1½ yd. cast-welded dipper bucket on number 6 Northwest shovel, working on U.S. Reclamation Service job at Grand Coulee.

You can take the toughest digging job in stride — if you have the right equipment.

The U. S. Reclamation Service project at Grand Coulee, Washington, is a good example. Here, with water from Coulee Dam, a vast area of desert is being turned into fertile farm land. And here *ESCO* dipper buckets dig their full quota every day with the least possible maintenance and loss of time.

The tougher your job is the more you will like *ESCO* buckets. They are built to give you

FASTER DIGGING. Clean cutting front with integral tooth bases and flaring outside teeth give clean, full bite. Tapered box permits quick, complete load discharge.

GREATER PAYLOADS. Lighter weight of *ESCO* buckets allows greater payloads. Hollow arch construction and use of manganese steel for all parts subject to wear and shock reduce weight without sacrificing strength.

LONGER SERVICE. Strain is distributed evenly throughout the bucket. Manganese steel parts resist wear and shock, get harder and tougher with use.

ESCO makes two different dipper buckets. The all-cast bucket is built for extremely hard service; the cast-welded bucket is lighter in weight, and is designed for general purpose work. These are fully described in catalogs 114B and 156 which your nearest *ESCO* representative will gladly give you. Or write us direct, and you will receive them by return mail.

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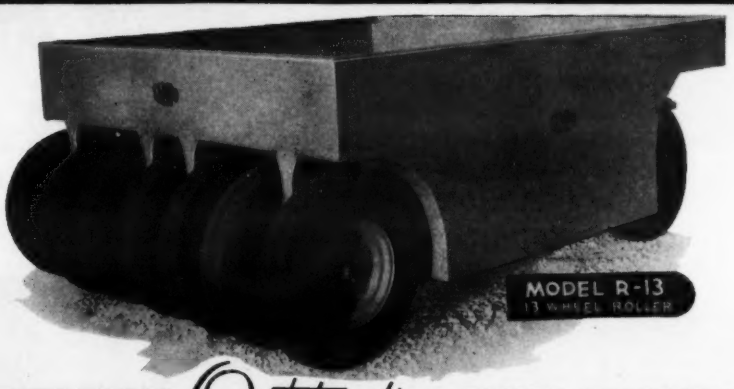

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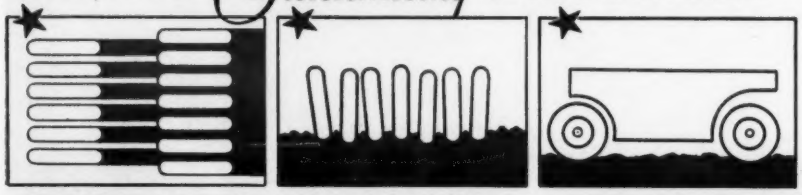

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Originated by TAMPO in 1940, permits any tire to dip down and roll low and soft spots; assures equal ground pressure on all tires, more uniform compaction.

UNDERSLUNG CHASSIS
TAMPO Rollers have an underslung chassis and a low center of gravity which makes them nearly impossible to upset on a slope or on sharp, quick turns.

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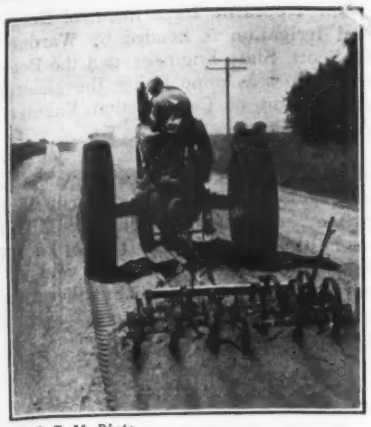

C. & E. M. Photo
Whenever weather looked the least bit promising on the Nebraska road-mix job, Farmall Model M rubber-tired tractors with spring-toothed harrows churned furiously through the wet windrows to dry out the moisture.

All Set to Road-Mix, Then the Rains Came

(Continued from preceding page)

material. A little scouting around near the rock pit disclosed a deposit of volcanic ash, silica, clay, and very fine sand. This was loaded by a Caterpillar-D4-mounted Traxcavator into the rented 5-yard dump trucks, and hauled in on top of the previously dumped coarser material. The windrow was calculated for 43 and 29 tons per 100 feet. Finished pavement was to include 3 inches of bituminous base covered by 2 inches of wearing course.

Mineral aggregate was laid down on one shoulder and equalized by four motor graders: three Adams machines and one Caterpillar. It was bladed back in a single row at night and as a protection from the ever-present misty rain. The finished windrow of sand and aggregate on a 43-ton station was 3 feet high, 8 feet wide at the base, and had side slopes of approximately 1 on 1.

Then the rains came. Temperatures previously up to 100 degrees sagged down to the 60's. Skies turned gray. A drizzle of rain was followed not by sunshine, but by more gray days. The windrow of mineral picked up more and more moisture.

Three Farmall Model M rubber-tired tractors with spring-toothed harrows were brought in to aid in evaporating this moisture. When the weather looked the least bit promising, the windrow was flattened by a motor grader and all three tractors and harrows began churning furiously through the sand, turning it over and over. The sun and the passage of air began to dry the sandy material. State inspectors, who had been saying "No mixing today", began to be more hopeful. Some days the hope was justified, some days not.

Road-Mixing

As soon as the first mineral was dried to the 3 per cent moisture limit, a Model 848 heavy-duty Barber-Greene traveling mixer was brought in and put to work on the windrow. A Cleaver-Brooks tank-car heater had been set up near the Rock Island railroad spur siding in the town of Ellis. Cars of RC-3 asphalt coming in from central Kansas were preheated to a temperature of 225 degrees F. This took about 6 hours per car on the average.

The hot asphalt was hauled to the Barber-Greene machine by two 500-gallon tanks mounted on a Dodge and a GMC truck. The tank hose was made fast to the machine, and the truck was towed along by means of a cable hooked from the Barber-Greene machine to a cleat on the truck. Asphalt entered the mixer at between 170 and 200 degrees.

The Barber-Greene machine, mixing in a 29-ton windrow, crawled steadily ahead at an average rate of 400 feet an hour, mixing Socony Vacuum RC-3 asphalt in with the material at a rate of 4 per cent by weight.

After the spring-tooth harrows had finished their work, the material was always windrowed back in position ahead of the Barber-Greene machine by motor graders. A Hough power broom was used on both windrow toes to brush every bit of material back where the machine would be sure to pick it up.

Weather then permitting, aeration and manipulation of the windrow of mixed surfacing began. Motor graders generally worked in pairs. The first machine cut a slice of black mix out from the toe and bladed it across the road. The second machine bit deeper into the windrow. Repeated passes were made until the entire windrow had been moved to the opposite shoulder. Since all heavy traffic had been detoured around the job on a secondary road, the only cars to contend with were those of farmers who live along State

(Concluded on next page)

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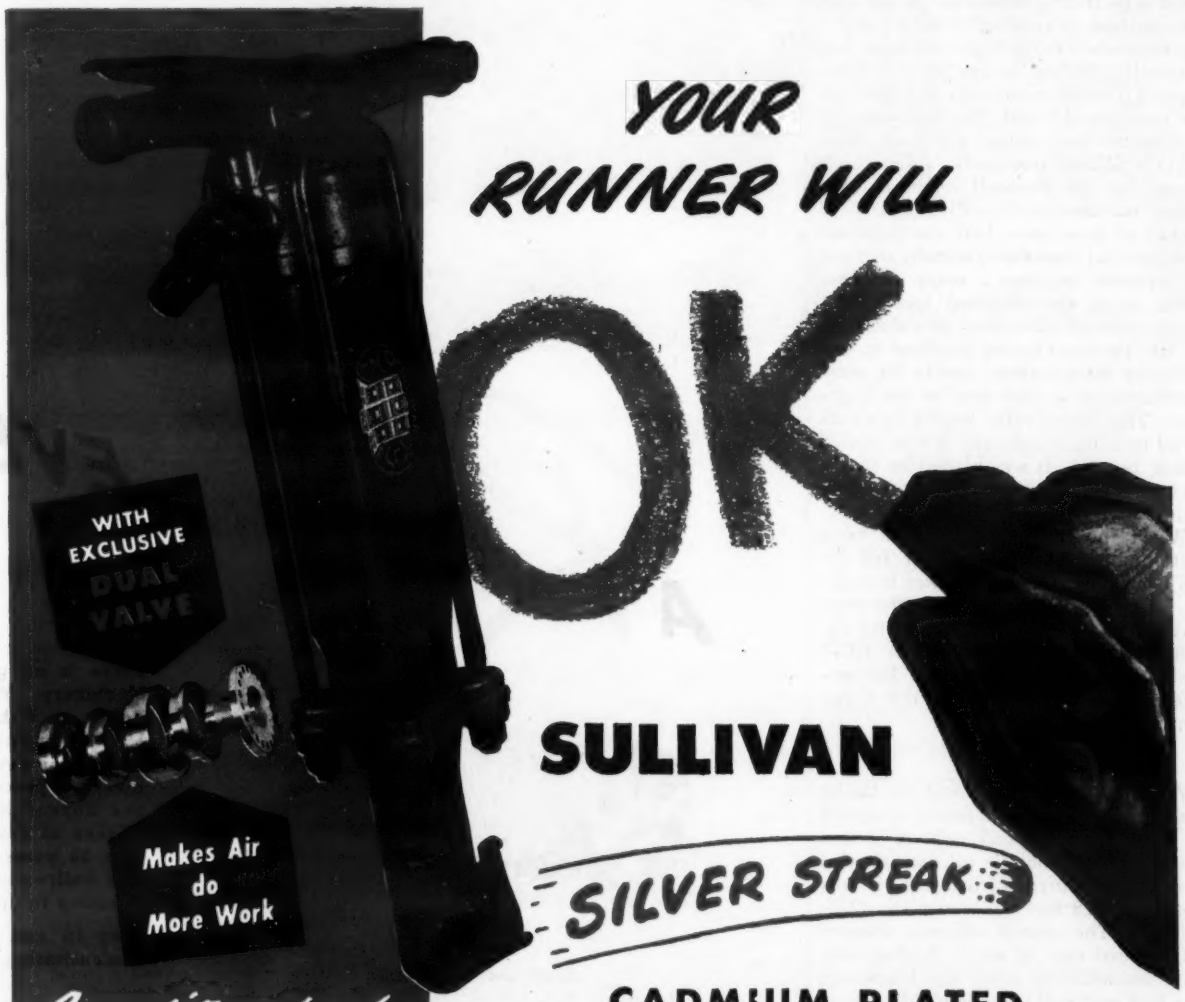

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Write for Bulletins

All Set to Road-Mix, Then the Rains Came

(*Continued from preceding page*)

Route 3. The bother was negligible.

Blading required about two full days, with tests being run continually to check on aeration. When the material was fit to be laid in, the opposite half of the base was primed by an Etnyre distributor mounted on a war-baby GMC truck. About 0.25 gallon of RC-3 per square yard, cut back with 10 per cent of diesel fuel, was sprayed on the road. It required about three passes to get the prime full width across the road. When the first pass was laid, the motor graders got busy and bladed the base-course material across the road and over the top of the fresh oil.

At the time the job was visited, the spreading and rolling had not yet been started, but plans for the rest of the project were complete and the equipment was there. When the prime coat was applied—according to these plans—motor graders cut into the windrow and gradually drifted layers of the bituminous mix not more than ¾ inch thick out over the old road. One Bros straight pneumatic-tire roller and one Bros Wobble Wheel pneumatic roller, both towed by the Farmall tractors, then rolled the road continually until the 3 inches of base were laid and finished.

After that was done, certain sections of concrete required a patch to bring them up to the required level. This patch material was mixed on a side road by the Barber-Greene machine in exactly the same manner and to the same specifications as that used in the highway. The Traxcavator loaded this material to dump trucks and it was hauled where needed. It was bladed by motor graders and also rolled by the Bros rollers.

When the patching was done on a section, the mineral aggregate for the top 2-inch wearing course was brought in. It was bladed and mixed in the same way as the lower course, except for the fact that about 5 per cent of RC-3 asphalt was applied by the Barber-Greene machine instead of the 4 per cent in the base course.

Sealing

When all the road-mixed surfacing had been laid down and finally trimmed by motor graders and rollers, a seal coat of RC-2 asphaltic oil was applied through the Etnyre distributor. It was distributed 28 feet wide over the 11.9-mile job. The asphalt seal was covered with a dust coat of sand. Sealing was done immediately after the black-top was laid, and will provide a riding surface as well as a skintight cover to keep out future heavy Nebraska rains.

Personnel and Quantities

The job was done under the general supervision of Lynn Horrocks, in charge of Inland Construction Co. work in the eastern half of Nebraska. Leslie Peak was the Superintendent who pushed the field work and cussed the weather the hardest. Wayne Culnell was the Project Engineer.

C. & E. M. Photo

An Adams and a Caterpillar motor grader pair up to manipulate and aerate road-mixed material. The first cuts a slice from the windrow and blades it across the road. The second bites deeper, until finally repeated passes have moved the entire windrow over the roadway to the opposite shoulder.

The Nebraska Department of Roads and Irrigation is headed by Wardner G. Scott, State Engineer, and the Beatrice job was done under the general supervision of Construction Engineer A. W. Bohner.

The main quantities in the job included 43,000 cubic yards of mineral aggregate; 68,900 gallons of cut-back prime; and 600,000 gallons of RC-3 asphaltic oil for binder. It is not known how you can measure worry and uncertainty about weather, but there was plenty of it in gallons, tons, or cubic yards.

Bruning's Fiftieth Year

A golden anniversary is being celebrated by the Charles Bruning Co., Inc., of Chicago, which completes 50 years of business in 1947. Founded by Charles Bruning in 1897 as a small blueprinting shop, the company has grown to one of the largest suppliers of equipment and materials for engineers and draftsmen.

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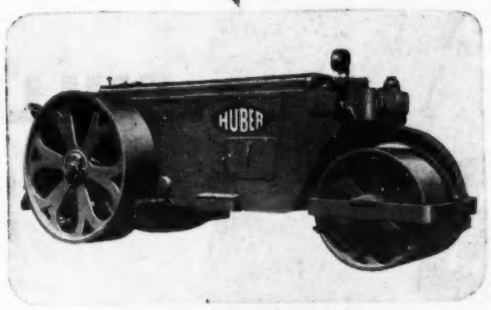

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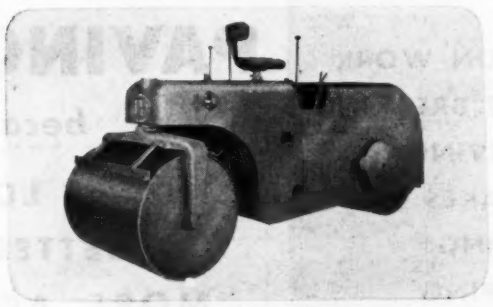
Automotive type, built in sizes from 5 to 12 ton.



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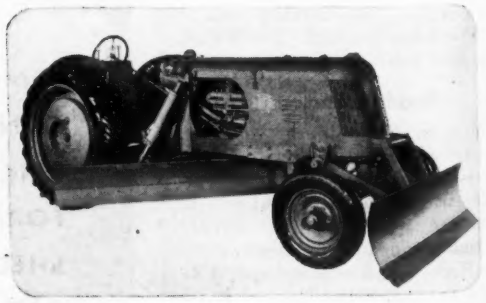

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3 Wheel • Tandem
ROAD ROLLERS and MAINTAINERS

Detection of bearing-oil leaks without the necessity of tearing down the engine is the function of this unit.

Oil-Leak Detector For Engine Bearings

Many of the troubles in truck and automobile operation come from leaking bearings. To help mechanics check all bearings and oil lines, Federal-Mogul Corp., Coldwater, Mich., has announced a new detector for bearing-oil leaks. With it, the firm claims, it is not necessary to tear down the engine to get an accurate picture of its condition.

By dropping the oil pan and hooking up the portable detector, you can tell the condition of all main, connecting rod, and camshaft bearings and oil lines, on any full-pressure lubricating system, Federal-Mogul says. The unit supplies clean oil at an accurately maintained pressure. The volume of escaping oil shows up any improperly fitted bearings, tight, or defective ones, or plugged oil lines.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 23.

Metallizer, Welder

A new type of powder-metallizing unit, the Colmonoy Spraywelder, has just been announced by Wall Colmonoy Corp., 19345 John R. St., Detroit 3, Mich. It was developed for use with the Colmonoy Sprayweld process, but is said to handle other powdered compositions too.

It is operated in the first part of the process as a powder-metallizing unit to apply a uniform overlay of the Colmonoy hard-facing alloy. It is then used as a conventional welding torch to fuse this sprayed overlay to the base metal and obtain a molecular bond. The bond is identical, the manufacturer says, to that obtained when the same alloy in rod form is applied by acetylene welding.

There are two control valves mounted on the gun. Once adjusted, the powder flow may be stopped and started by pressing or releasing the trigger. The gun may be hand-operated, held in a vise, or it may have an attachment in the tool post of a lathe.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 41.

Hughes Retires from GMC

The retirement of Frederick G. Hughes has been announced by the General Motors Corp., Detroit. At the time of his retirement, Mr. Hughes was a Vice President of the company and General Manager of its New Departure Division. He will be succeeded as General Manager by Milton L. Gearing.

Aerial Maps Help Reduce Design, Surveying Costs

The use of aerial surveys in highway relocation and realignment planning can reduce engineering costs, according to the Abrams Aerial Survey Corp., Lansing, Mich. In its recent catalog, the company states that the price of its air maps varies from about 1 to 15 cents per acre.

The catalog goes on to describe the photographic services offered by Abrams in black and white or color. These include preliminary maps, index maps, original mosaics, atlas sheets, stereoscopic prints, planimetric maps, contour maps, enlargements, and plan and profile maps.

The company maintains a complete consultation service as well as a school for training personnel in the latest methods of interpreting aerial photos and compiling maps.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 84.

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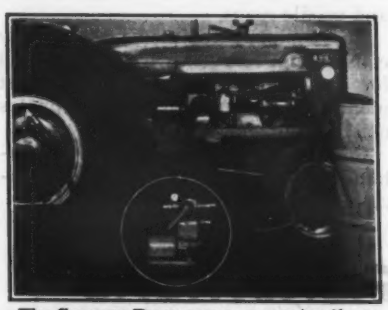


The Gorman-Rupp pump evacuates tires of liquid or air and then fills them with water or calcium-chloride solution as recommended by tire manufacturers. The capacity of the pump is 60 psi, and it is self-priming.

Water-Filled Tires Raise Drawbar Pull

Filling rubber tires with water is one of the interesting developments of the past ten years. A relatively new procedure, much experimentation has already gone into it and specific results have been achieved. At the present time, however, it is recommended only for tractors and slow-moving vehicles where traction is a problem.

The main advantage derived from liquid filling is that the weight of the vehicle is increased, thereby adding to drawbar pull and reducing slippage. It is estimated that drawbar pull increases approximately ½ pound for each pound of weight added. Moreover, calcium chloride added to the water gives it anti-freeze qualities. And since it is heavier than water, it also adds more weight to the tire.

Tire manufacturers' recommendations vary concerning the amount of liquid with which to fill the tire, ranging from 100 per cent to valve-level filling. Those recommending valve-level filling maintain that this leaves an air cushion which will give more flotation, increased resistance to shocks, and retention of the pneumatic principle.

The major drawback to the widespread use of solution-filled tires has been the need for pumps to fill the tire, having first effectively removed from it the surplus entrapped air. One such pump is made by the Gorman-Rupp Co., 275 Bowman St., Mansfield, Ohio.

The Gorman-Rupp pump is available in either electric-motor or gasoline-engine-driven models. Its capacity is 60 psi. Its manufacturer says it will evacuate tires of liquid or air and then fill with water or calcium-chloride solution. Optional equipment for this self-priming pump includes a tank for use as an air compressor.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 38.

Welder Mounts on Pick-Up

A welding unit mounted on a pick-up truck chassis is the subject of a folder released by Couse Mfg., Inc., 300 Passaic St., Newark 4, N. J. Designed to be a complete welder, the addition of a tool compartment and workplate makes it a portable shop on wheels.

The center spread of the announcement contains a drawing of the truck which shows the location of the various parts and the relationship of the power take-off to the rest of the welder. Complete details and specifications are given, as are sectional views of important details and features.

The welder may be run by current from a source of supply, or from its own generator. Power is obtained from the truck by means of a Couse power take-off. The dynamotor acts as a 20-hp motor when connected to a 220-v, 3-phase, 50 or 60-cycle source of current. Or it can provide 10 kw of this type of current when run as a dynamo. The chassis is a Ford 1-ton; the engine is a 100-hp V-8.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 80.

Reduce Maintenance Costs By Reclaiming Used Oils

An interesting discussion of oil purification, filtration, and reclamation appeared in the January, 1947, issue of *Lubrication*, a magazine of The Texas Co., 135 E. 42nd St., New York 17, N. Y. The problem of extending the useful life of lubricating oil has been and continues to remain an important part of good equipment maintenance.

The booklet describes the characteristics of used oils, and follows this with a discussion of the various methods of reclaiming used oils for continued use. The methods discussed are gravity purification, oil filtration, and oil reclaiming by clay-type reclaimers as well as by chemical means. All these methods are discussed in great detail in this 12-page issue.

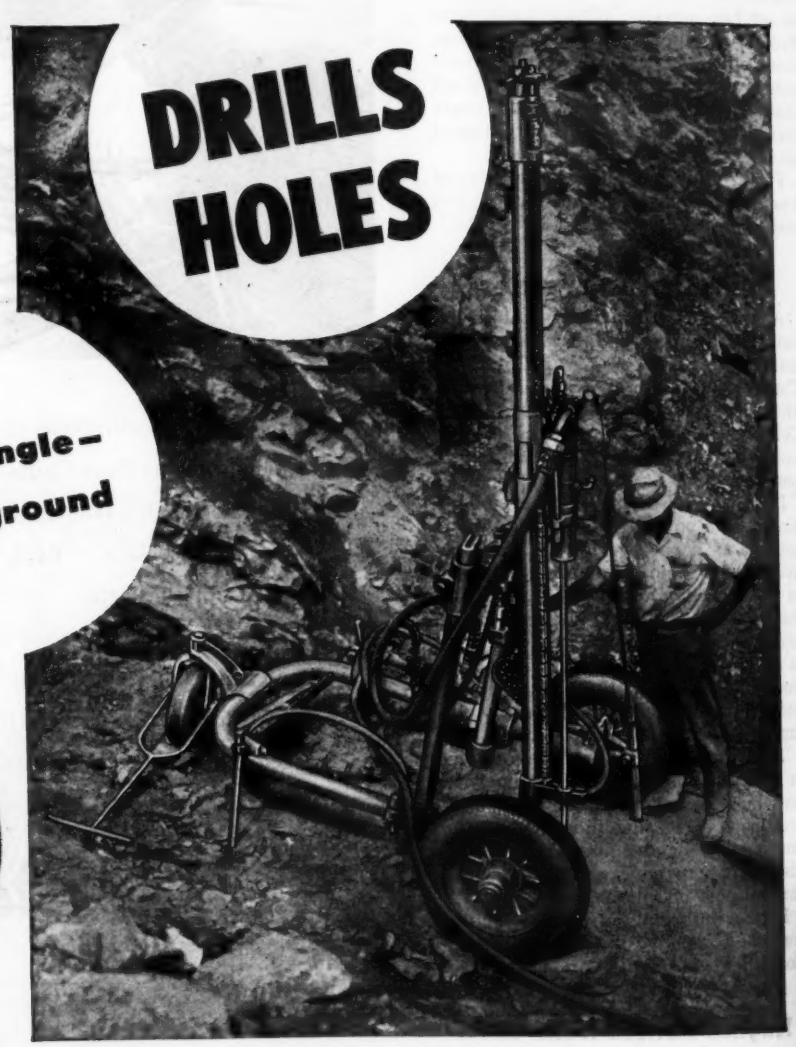
Throughout the booklet, a point stressed is that the cost of extending the useful life of oil must not exceed the value of the new oil which would have to be purchased were none of the methods used.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 10.

Placement Accessories For Reinforcing Steel

Accessories for use with reinforcing steel in concrete construction are described in Bulletin RSA issued by the Richmond Screw Anchor Co., Inc., 816-838 Liberty Ave., Brooklyn 8, N. Y. Perspective drawings illustrate the folder and indicate the heights of the various supports. Also included are placement data for joist, beam, and girder construction; one-way slab construction; and flat slab construction.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 61.



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The G-200 R Wagon Drill is available with CP-50 (3″), CP-60N (3½″) or CP-70 (4″) Drifters. Write for complete information.

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Wayside Parks Built On Scenic Highways

New Roadside Improvement Includes Concrete Picnic Tables and Benches; Site Takes Less Than One Acre

✦ THE Florida State Road Department recently completed five new wayside parks on some of its scenic highways as part of its roadside-improvement program. These parks occupy less than an acre of undeveloped land apiece. Their beauty, comfort, and safety features will serve not only native Floridians, but also a segment of the 3,000,000 pleasure-bent visitors who enter this state every year.

Construction of these parks started last autumn and was completed this spring. All five are located in western Florida. Two are along U. S. 98, the Gulf Coast Highway, between Apalachicola and Pensacola. Three others are on U. S. 90, the Old Spanish Trail; one is near Cottendale; the other is 3 miles east of Marianna; while the fifth is at Ellaville. Several others are now under construction. The Department acquired whatever additional right-of-way was necessary, and the construction was handled by employees of the Maintenance Division.

Picnic facilities in these parks are of sturdy construction. They are built to withstand the ravages of time, the rough treatment they will undoubtedly receive from visitors, and the occasional hurricane that may blow in from the Gulf. Walks, shelters, tables, benches, toilets, fireplaces, refuse containers are either concrete-slab or block construction; thus they require the minimum of maintenance.

These facilities are attractively laid out to accommodate as many as possible. They offer all the conveniences, either for a picnic or just for a place to pull off the road and rest during a long drive. This last feature is of particular importance in the interest of safety. For few roads provide a place for the motorist to stop, get out and stretch, or relax for a few minutes before continuing his trip.

The wayside parks on U. S. 98 command excellent views looking out over the Gulf of Mexico. And they front on wide beaches of white sand alluring to bathers or surf fishermen. One of these parks is near Beacon Hill west of Port St. Joe; the other is located outside Panama City. While not laid out to an identical pattern, all parks provide the same facilities. And the basic design permits economies in construction.

Typical Park

Beacon Hill Wayside Park is typical of the others along the Gulf Coast Highway. There the motorist may pull off the north side of the road directly onto an adjoining bituminous-paved parking strip, 100 feet long x 25 feet wide. Rimming the north boundary of the parking area are concrete blocks, 18 x 24 x 12 inches thick. They are placed on 5-foot centers, and are intended to keep cars in the allocated space and out of the picnic area.

C. & E. M. Photo

This view of the Beacon Hill Wayside Park on U. S. 98 in Florida shows one of its brick fireplaces, concrete-slab picnic-table shelters, and comfort stations. The parking area and the Gulf of Mexico are in the background.

Four concrete walks lead back to this area from the parking field. Another walk intersects them, running the length of the park which has a 100-foot front on the road by a depth of 120 feet. An additional 80 feet is cleared beyond this point as a fire safeguard for the grove of pine trees in the rear.

Along this front walk four concrete foundation slabs, 18 feet square, have been laid out. From each of these rise four 10-foot columns made of concrete blocks to support a wooden peaked roof. Under these shelters are two benches

(Concluded on next page)

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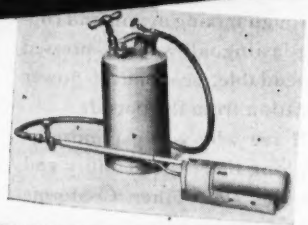

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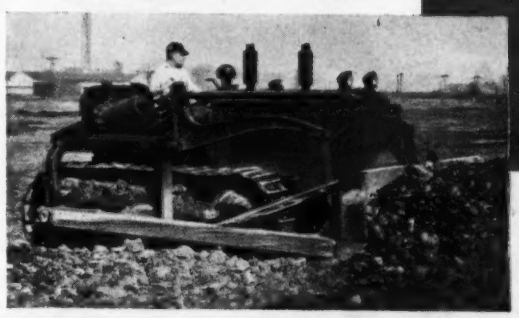

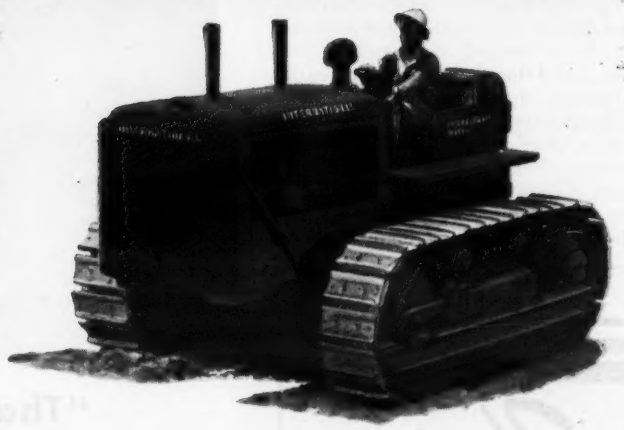

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Wayside Parks Built On Scenic Highways

(*Continued from preceding page*)

and a picnic table of concrete-slab construction mounted on concrete blocks. The slabs are 4 inches thick with the table top measuring 3 x 6 feet and the benches 2 x 6 feet. All are painted a battleship gray. Four tiers support the table top and two tiers support the benches. Behind each picnic table is another concrete slab laid in the ground to support another bench, of the same type, and a fireplace of brick complete with grate, chimney, and an iron front door. Near-by is a fresh-water spigot.

Further to the rear are two rubbish containers, one for every two picnic tables. They are 3 feet square x 3 feet high. And they are constructed of 3½-inch brick walls with an opening at the bottom to provide a draft when trash and refuse are burned. The park also contains two comfort stations, one for men and one for women, of concrete-block construction. Another similar house contains a pump which draws fresh water from a deep well.

Across the road is a stretch of white beach, from 75 to 100 feet wide even at high tide. At the center of the beach one picnic table and two benches have been built on a concrete slab for the convenience of beach parties. A couple of young palm trees have been set out which will shade the spot when they are grown.

The other parks differ from the one at Beacon Hill only in the matter of size and shape. All provide parking fields, running water, picnic tables, outdoor stoves, and comfort stations. The park near Panama City also has two outdoor shower baths for bathers to wash off the salt water and sand.

In the past, many people have stopped along the roads for a picnic lunch. They have parked their cars on the shoulders to the danger of themselves and others. They have littered the ground with refuse. And they have been a potential fire hazard, by reason of carelessly tossed cigarettes or camp fires left burning after they have gone. Road Department officials expect that the existence of these wayside parks will improve the situation.

The parks are open to the public both day and night, but no overnight trailer parking is permitted. At present these park areas, particularly along the beaches, are mostly bare of planting or shrubbery and the soil is sand with little or no cover. Later on it is hoped to plant native trees and bushes and get some grass growing on the sites.

C. & E. M. Photo

Another of the wayside parks the Florida State Road Department has recently completed is about 15 miles west of Panama City on U. S. 98. It follows the same basic design as the others: parking area, picnic tables, fireplaces, etc.

Personnel

The Florida roadside-improvement program is under the direction of William A. Kratzert, State Maintenance Engineer. The field work is supervised by W. Guy Stovall, who is Superintendent of Wayside Parks. The State Road Department is headed by F. Elgin Bayless, Chairman, with E. C. DeGarmo, State Highway Engineer.

Accidents are unnecessary and costly. Remember—Safety Always Pays.

Dragline, Trench Hoe

A folder describing the Schield Bantam truck-mounted dragline and trench hoe is being distributed free upon request to the Schield Bantam Co., Inc., Waverly, Iowa. Well illustrated, it pictures the unit in operation and describes its performance features. A supplement is included on a clamshell bucket and power shovel which are now available as new equipment for use with the unit.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 55.

Roebling Advances Two

The appointment of A. R. Robinson as Manager of the company's Seattle branch has been announced by John A. Roebling's Sons Co., Trenton, N. J. Announced at the same time is the appointment of J. F. Berger to the position of Assistant Sales Manager of the Woven Wire Fabrics Division.

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See them at your local Rex Distributor or write Chain Belt Company, 1666 West Bruce Street, Milwaukee 4, Wisconsin, for all the facts.

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CONTINENTAL RUBBER WORKS

The Highway Dollar Today and Tomorrow

Why These Rising Costs For Road Construction? What to Do About Them? Role of Competition

By DWIGHT W. WINKELMAN, Vice President, The Associated General Contractors of America

♦ DURING 1946 work got under way on the Federal-Aid post-war highway construction program. This was to be the greatest single highway program in history. But we all know that highway construction during that first post-war year did not reach the volume anticipated.

When the year started, bids were being taken on projects which for the most part had been planned earlier. Their costs in many cases had been figured on the basis of pre-war prices. Contractors were rebuilding their organizations. Materials and equipment were scarce. Labor was scarce. Business conditions were unsettled. And highway officials were caught squarely between the urgent need for highway construction and the rising costs.

Prospects for 1947 are for stabilizing prices and an expanded construction volume. But I believe that now and for some time in the future, local officials, state highway departments, the Public Roads Administration, and the public will have to become adjusted to new costs for highway construction. These will be higher than in pre-war times, but in line with costs generally.

Along with that belief, I want to make this statement, and emphasize it: in my judgement, the strongest force for reducing highway costs in the future will be competition within the construction industry—competition for more efficient methods of producing the constantly improved highways which will be designed.

Our immediate goal, therefore, is stabilization of construction costs, concurrent with the contractor's ability to make a firm bid on a competitive basis as uncertainties are removed.

Cost Elements for the Contractor

In order to consider the major trends which have brought about some of the increases in highway costs, we must first consider costs from the contractor's viewpoint. For him they are composed of two elements roughly classified as those within his control and those beyond it.

Within his control is the selection of method, personnel, and equipment for performing work and, of course, the energy to carry out his operations. Relatively beyond his control are the design of the project, specifications for quality and workmanship, type of materials to be used, width of road, depth of pavement, straightness of alignment, reduction of grade, etc. Also beyond his control are elements of cost stemming from taxation, labor laws, regulations, requirements to keep records, etc.

Currently the contractor has had even less control than usual over his costs. In particular, he has had to face uncertainties over labor—its wage rates, its availability, and its efficiency.

Highway Costs and Labor

There is a national trend towards higher wages and salaries, and it is inevitable that highway wages should be influenced. In the past, much highway work was undertaken on an open-shop basis and in rural communities in which the rural wage rate prevailed. Now labor unions are growing, and more highway construction is being done by union labor. Large express-highway projects have served as an opportunity for unions to organize highway work and introduce higher wage scales into rural territories.

In the future, consultations between representatives of labor, contractors, and highway departments will become necessary in the development of sound wage rates. President Truman recently announced plans for the National Joint Conference Committee, which will have separate committees for handling disputes or disagreements in each branch of construction. The committee to handle disputes in the highway field will be composed of a member from the AGC who is representative of the road-construction industry, and one member of a labor organization whose members

(*Continued on next page*)

HOT *or* COLD *Mix Asphalt*

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DEPENDABLE

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CHATTANOOGA, TENNESSEE, U.S.A.

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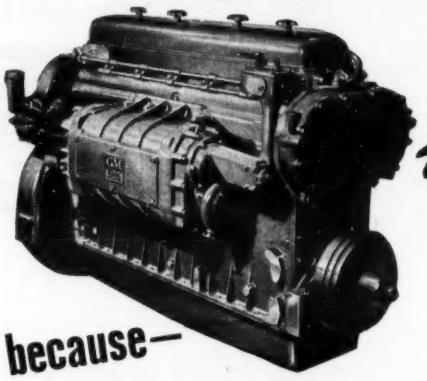

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because—

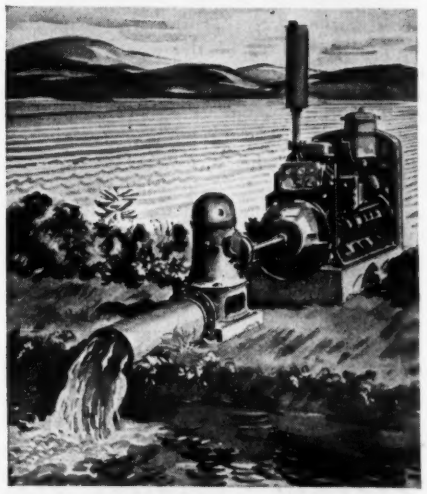
there's power at every downstroke

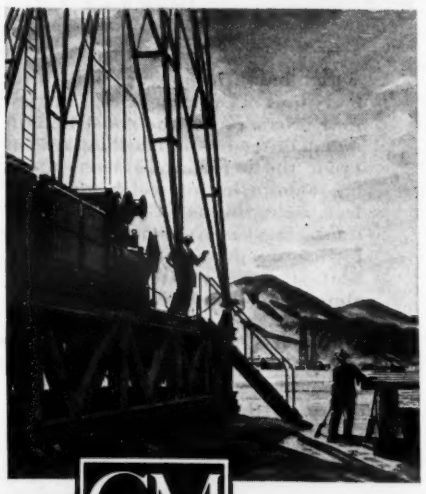
No matter where a General Motors Diesel engine goes to work, you can count on a smooth, steady flow of power. Because each piston downstroke is a power stroke, there are twice the number of power impulses for each turn of the shaft. A "six" is as smooth as a "twelve" in an ordinary engine.

Besides there's better acceleration under a load—and starting's quicker.

So it's easy to see why GM Diesels are "naturals" wherever a steady, sturdy, smooth source of power is required—why they are top-notch for lumbering, fishing, construction, well drilling and for every job where tough, compact, dependable power is needed.

So, no matter what your requirements might be, if you want sturdy, money-making, safe power, be sure to look into General Motors Diesel engines.





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GENERAL MOTORS

GM GENERAL MOTORS DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK

The Highway Dollar Today and Tomorrow

(*Continued from preceding page*)

are predominantly employed in highway construction.

Not only are wage rates higher. Today so-called common labor is also scarce and less efficient than it was in 1940. Many experienced construction workmen during the war obtained semi-skilled and skilled occupations in shipyards, factories, and other types of work. The men recruited to take their places are less experienced, and in many instances are not as interested in their work as were their predecessors.

Moreover, the most important factor in the decrease of labor efficiency has been the inability to obtain delivery of materials when and as required. It is unreasonable to expect men working on a job to use up available materials in a hurry, and then be laid off for brief periods to wait for more materials.

It is expected that this factor will be lessened substantially with higher materials production this year. With the increased rates of pay, it is increasingly important that operations be scheduled so that materials will be delivered to the job when needed to keep it going.

Cost of Materials in Highways

Another major element of highway costs is materials. During the past year contractors were faced with the difficulty that prices for materials were not established until deliveries were made. And more costly to the contractor than the increase which might result was the uncertainty as to time of delivery, making it impossible to schedule operations most efficiently.

There also was little competition among purchasers for materials and little among sellers because of scarcities.

It is anticipated that the increased rate of production of most materials will continue. This will ease the situation to a large extent during the coming months and bring about an early return of competition for their sale. But until that time, the contractor is not able to exercise fully one of his principal functions: that of being an economical purchasing agent.

Equipment in Construction

I have always been an advocate of mechanization to the highest degree possible in construction operations. One of the methods by which contractors can cut highway construction costs is through the use of machinery which increases the productivity of workmen.

Much of the equipment being used now is war-weary, worn, and subject to more than the ordinary number of breakdowns. Manufacturers have indicated that 1947 is expected to be a fairly good production year. But it is also expected that the majority of contracting organizations will not have fully renewed equipment until conditions in general have definitely improved.

Costs of equipment have been increasing, and I think it reasonable to assume that equipment will be more expensive in the future. However, there is no doubt that present labor conditions will have a tendency under the competitive contract system to bring about further mechanization. Better equipment will be developed, equipment designed to do more kinds of work more efficiently, and at lower unit costs. And contractors must continue efforts to mechanize their operations as far as possible.

Highway departments which are interested in securing the best prices in the future should make a careful study of new equipment and the methods made possible by it, so that maximum advantage can be taken of improved methods in design and specifications.

Higher Pay for Engineers

Highway departments must also look to a cost element in their own organizations—salaries of highway engineers. We realize the difficulties being caused by a general lack of sufficient engineering personnel to supervise large programs adequately. The Joint Cooperative Committee of the AASHO and the AGC recently recommended that steps be taken to adjust salaries of highway engineers. The failure of many states to increase such pay was held as detrimental to the conduct and progress of the highway program.

Failure of engineers discharged from the services to return to former highway department jobs was reported delaying output of needed highway plans. And field supervision of construction operations was held "bound to suffer", resulting in aggravated problems for both engineers and contractors.

What Can Be Done About Costs?

There are a number of things which highway officials can do to help reduce costs without seriously impairing the soundness of highway construction. Out of meetings of the Joint Cooperative Committee of the AASHO and AGC have come these suggestions:

1. Eliminate hand-labor items as much as possible, such as hand rubbing of concrete, fine-grading, slope rounding.

2. Develop tolerances which will encourage maximum mechanization in grading, paving, etc.

3. Where feasible, particularly on secondary roads, reduce compaction requirements; for example, permit deeper lifts on fills. This is probably justified

(*Continued on next page*)

OTC MAINTENANCE TOOLS for FAST REPAIRS on the Job or in the Shop

The OTC PULLING SYSTEM makes quick work of removing and replacing gears, bearings, sleeves, wheels, pulleys, shafts and other close-fitting parts—without damage to machinery, without back-straining labor. Approved by Hyatt, M-R-C, New Departure, SKF and Timken for use on their bearings. Portable . . . as effective for field maintenance and repairs as for shop use.

To meet YOUR Needs—OTC GRIPOMATIC PULLERS, PUSH-PULLERS, Pulling Attachments and Adaptors. Heavy Duty BOX WRENCHES and Special Tools are made in a wide range of sizes and types.

OTC Maintenance Bulletin shows some of the many time-saving uses of OTC TOOLS. Write for a copy.

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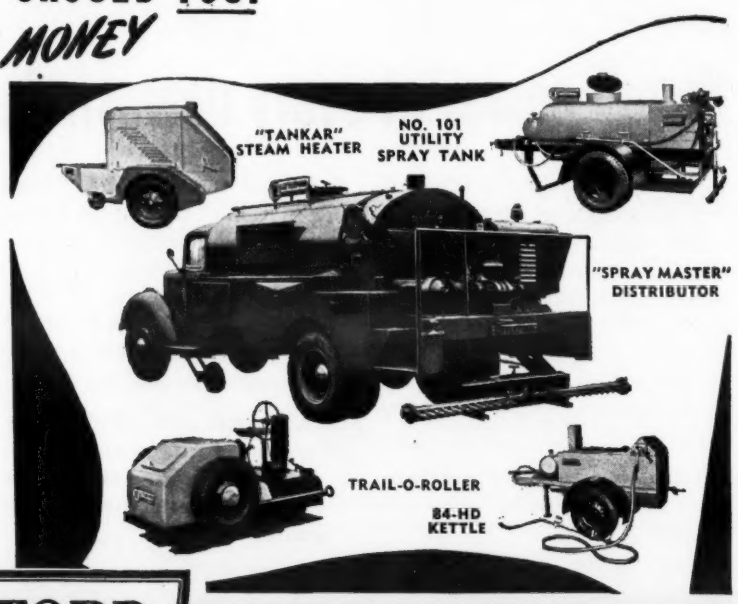
Roads Must Take a Beating ... but WHY SHOULD YOU?

LITTLEFORD SAVES YOU MONEY

Speed and efficiency are built into every unit of equipment that Littleford produces for the construction and maintenance of black top roads. From the big Spray Masters that lay it down in any width up to 24 feet, right through the line to the most inexpensive spray kettles, Littleford equipment moves faster, heats faster, operates faster. For almost fifty years Littleford has engineered and designed simplified units for every function in heating and application. Save yourself some money by getting the facts about the entire Littleford line. Write for Catalog W.



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for contractors, highway officials and distributors wanting further details or printed matter from the manufacturers advertising in these pages. Our Reader Service Department will be glad to forward any literature or special requests you mail to us at the above address.

CONTRACTORS AND ENGINEERS MONTHLY

The Highway Dollar Today and Tomorrow

(*Continued from preceding page*)

by use of modern equipment which is heavier than that formerly used.

4. Re-study earth-compaction requirements with a view towards permitting greater tolerance in moisture content and material specifications.

5. Design concrete structures so as to permit the use of standard forms, thus saving labor and lumber. Research indicates that longer life in reinforced-concrete structures results from larger-sized members. This also reduces the cost per cubic yard.

6. Use pipe culverts instead of box culverts where possible until the present situation eases. In areas of light rainfall, "dips" can be used temporarily.

7. Lengthen the working season by every device possible in plans, specifications, timing of lettings, etc.

8. Set up projects which can be completed within one season.

9. Enforce any substantial changes in requirements. In some localities where changes have been made, contractors report that the hoped-for cost decrease did not materialize. This was due to failure to get word down the line from top officials, or to over-enthusiasm for refinements on the part of field engineers and inspectors.

Finally, something else can be done about costs. A balanced program of large and small jobs should be made up to fit local conditions and promote competition, without losing sight of the economy to be gained on large jobs. There is a definite need for the development of more small contractors, and encouragement should be given to those who cannot afford huge outlays of funds for equipment. This can be done especially in secondary-road programs. The small jobs serve as a sort of apprenticeship for highway contracting.

Maintenance by contract also should be given serious consideration. The Committee on Economics of Highway Construction and Maintenance Methods of the Highway Research Board is gathering material on this subject. The contract method stimulates competition which is always conducive to more and better work for less money, and results in more rigid inspection and control of materials.

Improved Design and Construction

One further important factor which must be considered in highway costs is the constant improvement in design and quality of highway construction. This trend will undoubtedly continue.

Greater care is taken in compacting the subsoil now as compared with previous times. Pavements are wider, thicker, and of better quality. The entire right-of-way is wider. Alignments are straighter. Grades are smoothed out, requiring more cuts and fills. More structures are added to reduce traffic hazards. Specifications have been refined to improve quality.

All of these factors increase the per-mile cost of a highway. But the result is a highway which is probably less expensive to maintain, which is much safer to travel, which handles traffic more easily, and which makes operation of motor vehicles more economical.

A New Concept of Highway Costs

We have always measured expense of highway construction in terms of cost per mile. But I dare say that the construction cost of a well designed modern highway, if measured in terms of *vehicle capacity per hour*, is less than in pre-war years.

Let me quote a recent statement by Commissioner of Public Roads Thomas H. MacDonald on the subject of controlled-access highways:

"Very naturally, the first reaction of the highway official is that highways of this class are too expensive. This results from our thinking in terms of cost per mile, which has long been our unit of measure, rather than cost measured by vehicle capacity per lane per hour. Some such cost unit will have to be used in the future in our plans to relieve urban congestion. One well designed four-lane expressway will carry the same number of vehicles at nearly double the average speed as five 40-foot-wide ordinary city streets on which parking is prohibited, and under favorable control of cross traffic from intersecting streets. Under unfavorable conditions eight 54-foot-wide city streets would be required to carry the same volume of traffic that may be carried by a single four-lane controlled-access highway. These comparisons are so startling that many well informed engineers will not easily accept them."

The Outlook

As you know, there has been some feeling that work should not proceed while prices are high. It is the belief of contractors that a highway department has nothing to gain from holding up all work to see what happens.

Contractors are the men who build our highways. It is to the advantage of highway departments to help prevent the loss of qualified contractors, especially at this time when they are trying to rebuild their forces into more efficient organizations after the dearth of highway work during the war years.

Statistics show a smaller number of highway contractors operating now than during pre-war years. Yet many who combined with others or performed other work during the war are again coming into the highway field. New names will be appearing. And the Department of Commerce reports that of

(*Concluded on next page*)

MURPHY DIESEL COMPANY, 5319 W. Burnham St., Milwaukee 14, Wis.

Mountains of PROFITABLE "AGLIME"

"Universal 'Stream-Flo' crushing plant produces 275,000 tons lime dust and road rock with less than 1/5 cent per ton necessary for repairs."

So says, Lourde T. Renner of Sterling, Illinois who finds lime dust production mighty profitable with his Universal "Stream-Flo" crushing, screening and loading plant. During the past 24 months this plant produced 275,000 tons of lime dust and road rock with less than $500 necessary for repairs. Average daily production is 200 tons per hour. 21,000 tons of lime dust and 1000 tons of road rock have been produced in a single month.

The Renner plant uses a Universal 546-P portable primary crushing unit with a 36"x8' apron feeder and a 20x36 roller bearing jaw crusher. Material flows by conveyor to a 2-deck gyrating screen mounted over a 3-compartment steel bin. Oversize is mechanically fed to a No. 5 Universal pulverizer and returns to screen via conveyors. Plant set-up is primarily for lime dust production but a simple adjustment gives both lime dust and road rock without changing screens. Finished material is loaded from bin or stock pile.

There's profit in lime dust production. Let Universal show you how to produce "aglime" at a cost that leaves more profit. Write for illustrated literature and the facts.

MORE TONS PER HOUR—LESS COST PER TON

ROCK, GRAVEL AND LIME CRUSHING PLANTS • CONVEYORS • APRON FEEDERS SCREENING AND WASHING PLANTS

UNIVERSAL ENGINEERING CORPORATION
620 C Avenue N.W., Cedar Rapids, Iowa

"John says if he has these conveniences at work, I should have them at home!"

The Highway Dollar Today and Tomorrow

(Continued from preceding page)

all major industrial groups in the first half of 1946, the highest rate of entry prevailed for contract construction.

A study of all these trends we have mentioned indicates that highway costs will level off on a new plane, that the immediate prospect is for stabilization of construction costs, and that some economy can be achieved by closer cooperation between highway officials and highway contractors.

Balanced against the trends for higher costs will be the development of more efficient machinery and methods, retarding of material price increases by competition through increased production, and an expected increase in the productivity of labor.

And let me repeat: I believe the strongest force for the reduction of highway costs in the future will be competition within the construction industry for more efficient methods of producing the constantly improved highways which will be designed.

From a paper presented by Mr. Winkelman at the 23rd Annual Convention of The Association of Highway Officials of the North Atlantic States, held at Atlantic City in February, 1947.

Valve-Maintenance Shop Tools and Kits

A complete line of valve-maintenance equipment is made by the K. O. Lee Co., 1104 First Ave., S.E., Aberdeen, S. Dak. It includes reseater sets, refacers, valve-seat grinders, and rod aligners. The equipment is designed to handle maintenance work on the large engines used in construction equipment.

The Knock-Out line is said to be complete in all sizes. Parts may be ordered in sizes desired. Or special kits are available, containing parts for all jobs. Three reseater kits are available: the Model R204 designed to service all makes of cars, trucks, and tractors; the Model R203 designed to serve 90 per cent of them; and the Model R202 which is built up to meet the requirements for any particular model or style of car, truck, or tractor.

The valve-seat grinding equipment is similarly put up in three models; the Model P302 Universal set; the Model P301 Junior set; and the Model P300 Basic set. The valve refacer is made in one model, Model K3. The rod aligner comes in small Model C1, and in larger Model C3.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 93.

Raybestos Promotes Three

Two vice presidents and a director have been added to the roster of Raybestos-Manhattan, Inc., Passaic, N. J. John H. Matthews was elected Vice President in charge of the Manhattan Rubber Division at Passaic. O. H. Cilley, Assistant General Manager of the United States Asbestos Division, Manheim, Pa., was made a Vice President. And A. F. Heinsohn, General Manager of General Asbestos & Rubber Division, North Charleston, S. C., was placed on the new Board of Directors.

How American Industry Uses Powered Machines

The latest edition of "Production Road", company magazine of the Twin Disc Clutch Co., Racine, Wis., pictures the uses of powered machinery in modern American industry. The issue is divided into industry classifications; among them are construction and material handling, metal fabrication, and engine building.

The "Manufacturers' Issue", as it is called, contains 52 pages and 153 illustrations showing machines and engines which incorporate the use of Twin Disc units. Some 360 manufacturers are listed who install as standard or optional equipment Twin Disc clutches, power take-offs, reduction gears, machine-tool clutches, marine gears and multiple-engine hydraulic drives, hydraulic couplings and power take-offs, hydraulic torque converters, and air-actuated clutches.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 72

Use DAREX AEA

For durable, plastic concrete with controlled air content

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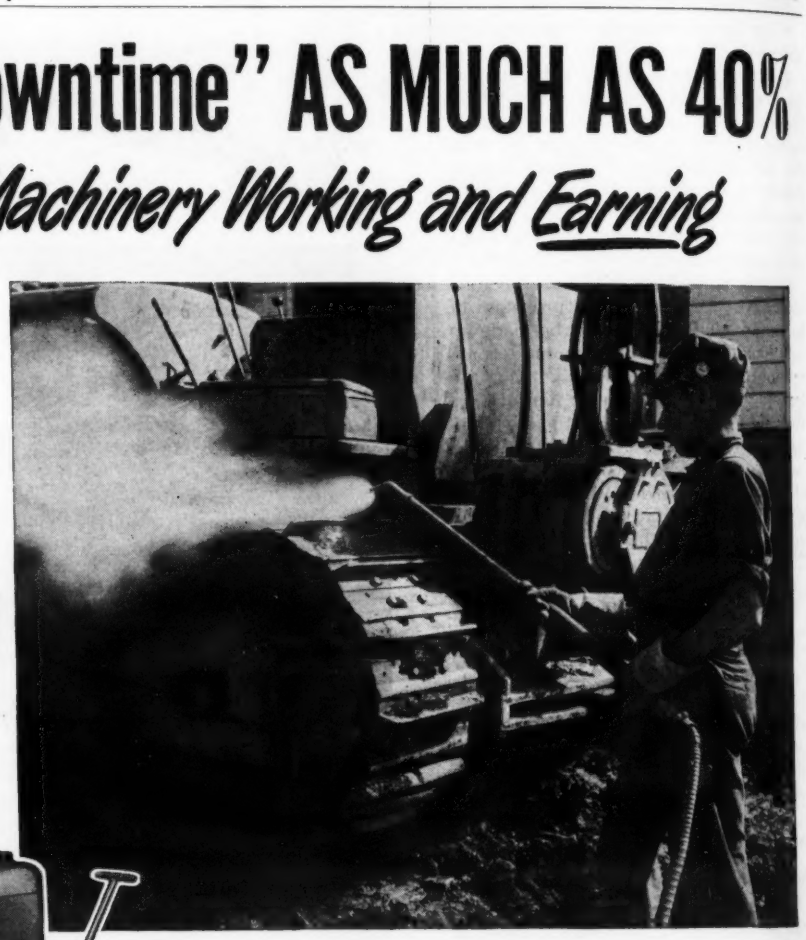
DEWEY AND ALMY CHEMICAL COMPANY
CAMBRIDGE 40, MASS.

REDUCE "Downtime" AS MUCH AS 40%

Keep your Machinery Working and Earning

WITH HYPRESSURE Jenny STEAM CLEANER



Hypressure Jenny Steam Cleaner is ready to operate from a cold start in less than 1 minute after pressing the starting switch. Cleaning is accomplished by a highly atomized mixture of steam, hot water and cleaning compound, applied under powerful pressure. Hypressure Jenny is sturdy, compact, safe and easy to use.

Your mechanics work easier and with greater safety on machinery that has been Hypressure Jenny Steam Cleaned *before* repairs. Time studies reveal that when workmen are forced to repair dirty equipment as much as 40% of their time is wasted wiping grease and oil from tools and equipment. Hypressure Jenny Steam Cleaning eliminates the use of inflammable cleaning fluids thus contributing to the safety of both men and property. One man using Hypressure Jenny can clean more equipment in 1 hour than 10 men can clean in the same time with brush and scraper.

In addition to saving time on repairs Hypressure Jenny Steam Cleaning rids construction equipment of accumulated mud, muck and grease, thus adding to the efficiency of both men and machines.

Why not write us for complete details and the address of your nearest Hypressure Jenny dealer. There is no obligation.

HYPRESSURE JENNY DIVISION
HOMESTEAD VALVE MANUFACTURING COMPANY
P. O. BOX 30 · CORAOPOLIS, PA.

The Evans Auto-Railer, with a Quick-Way ¼-cubic-yard truck shovel mounted on an International chassis, is a dual-purpose vehicle designed for operation on both railroad tracks and highways.

Truck Shovel Rides Roads or RR Tracks

A truck-mounted power-shovel unit for use by contractors handling railroad work has been made possible by combining the products of three equipment producers. The truck chassis complete with pilot-wheel assembly, is known as the Evans Auto-Railer, and can be driven over highways or railroad tracks. The retractable pilot wheels and undercarriage are made and assembled to the chassis by Evans Products Co., Plymouth, Mich. The ¼-yard truck shovel is made by the Quick-Way Truck Shovel Co., 4150 Josephine St., Denver 1, Colo. And the Model KB-5 chassis is made by the Motor Truck Division of International Harvester Co., 180 No. Michigan Ave., Chicago 1, Ill.

The shovel is powered by an I-H 4-cylinder engine. The unit is convertible for use as trench hoe, crane, dragline, clamshell, orange peel, or pile driver. The flanged steel railroad pilot wheels are mounted on tapered roller bearings. They are raised and lowered hydraulically by controls on the dash, and they carry all the weight not carried by the pneumatic tires.

The Auto-Railer can be run over the highway to the railroad crossing nearest the point of work, and then run the rest of the way on the track. All driving and braking is through the special pneumatic tires which enable operation under all track and weather conditions, according to the manufacturer. It is said that the Auto-Railer can be maneuvered on the track in less than one minute.

The manufacturer also explains that in driving off the track at a crossing, it is not necessary to come to a complete stop. The pilot wheels and axles are raised as soon as the road crossing is approached, at which time the vehicle is driven directly onto the highway.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 48.

Safety Belts and Helmets

Its line of safety equipment is listed in a 32-page catalog issued by the Portable Safety Division of the Portable Products Corp., 420 Blvd. of Allies, Pittsburgh 19, Pa. This line includes reflector belts made with Scotchlite, product of the Minnesota Mining & Mfg. Co.; body-type and harness-type safety belts for bridge and structural-steel workers; bos'n suspension harness; face masks; safety caps and hard hats; etc. The catalog contains photographs, order numbers, and prices.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 69.

Diesel Fuel Injectors

Information on performance, manufacture, and maintenance of diesel spray nozzles and nozzle holders is found in Catalog 3204 issued by the American Bosch Corp., Springfield, Mass. It describes both the pintle and hole-type nozzles, indirect or direct-cooled.

The bulletin has many cutaway photographs and drawings which show the features of construction and how these units operate. The pictures are accompanied by explanatory text. Two pages of the catalog are devoted to a detailed discussion of the spray nozzle and nozzle holder, the way in which they should be removed, disassembled, cleaned, and returned to use.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 81.

COFFING HOISTS

"Safety-Pull" Hoist Pulling Concrete Forms

Contractors - Engineers
Superintendents - Foremen

Have long been specifying COFFING "SAFETY-PULL" Ratchet Lever Hoists for all kinds of lifting and pulling jobs in their construction and maintenance work. These light weight, portable time and labor saving hoists are built in capacities ranging from ¾ to 15 tons yet they weigh only 14 to 150 pounds.

WRITE FOR BULLETIN SH-3.

COFFING HOIST CO.
DANVILLE, ILLINOIS

Thor SINKER ROCK DRILLS

SOME BLOW! Thor Sinker Rock Drills excel in hole-cleaning capacity—and here's why: "straight-line" design delivers controlled air straight through the heart of the tool *at full pressure.* Teamed up with a *harder hammer blow*, "straight-line" design means faster penetration, more footage per shift. *Prove this to yourself on your own jobs. Call your Thor dealer for a demonstration.*

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Salt Lake City San Francisco Toronto, Canada London, England

Thor Sinker Rock Drill (Model 75—Heavy Duty)

Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

Pete Johnson of Marinette, Wis., does extensive contract work in heavy trucking, grading, and excavating. During the summer, he is kept busy dredging and cleaning up beaches and harbors along the Lake Michigan and Green Bay shore line. This picture, taken near Menominee, Mich., shows Johnson's Allis-Chalmers HD-7 tractor, powered by a 3-cylinder General Motors 2-cycle diesel engine, working in deep water. When the fan blade begins to throw water, they know they are deep enough.

Stricken Texas City Aided by Contractors

Members of The Associated General Contractors of America, through its Houston Chapter, immediately furnished man-power and equipment in response to appeals for help when disaster struck the town of Texas City in April.

The Houston contractors helped rescue the injured, remove the dead, and later clean up the debris. Many stopped their job operations, sending their own men, trucks, bulldozers, heavy cranes, draglines, and other equipment to the scene of the blast. Two mobile lighting plants were transported to Texas City for night work through the efforts of the chapter.

Another service they rendered was the certification of Texas City buildings as being safe or unsafe for occupancy. Responding to radioed requests, 51 of the 74 general-contractor members went to Texas City and checked about 3,000 homes and business buildings over a three-day period.

Three members of the Houston Chapter had construction contracts in progress at Texas City at the time of the explosions. The W. S. Bellows Construction Co. had work in progress for the Monsanto Chemical Co., and 78 of its employees were in the explosion. Of these, 17 are known to be dead, 11 are missing, and a number of others were injured. Tellepsen Construction Co. and the R. P. Farnsworth Co. had projects under way, but lost no personnel. Monsanto has retained the Bellows Co. for cleaning up the debris of its wrecked plant.

In thanking the members, Leo E. Linbeck, President of the Houston AGC Chapter, said, "Your response was immediate, it was 100 per cent, and it has reflected great credit upon the industry and to our association."

Standards for Concrete And Concrete Aggregates

The most recent compilation of standards for concrete and concrete aggregates has just been published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. It covers standard and tentative specifications and test methods for aggregates, cement, concrete, concrete-curing materials, concrete reinforcement, expansion-joint fillers, and sieves for testing.

The publication is sponsored by Committee C-9 on Concrete and Concrete Aggregates, but the work of several other committees is represented. Twenty-one standards relate to aggregates. Of these, two are specifications; three are definitions; and the rest are test methods. Four specifications for cement are given. Three specifications relate to concrete-curing materials, and there is a test for the water-retention efficiency of various methods for curing concrete. Six specifications cover concrete reinforcement, and there are two on expansion-joint fillers and sieves for testing purposes.

The remaining standards and specifications in this 160-page book deal with concrete: tests for air content, compressive strength, flexural strength, slump, volume change, etc.

Copies of this publication may be obtained from the Society. Price: $2.00.

Precision Plumb Bob

A plumb bob featuring minute vertical adjustment is announced by Suverkrop Instruments, P. O. Box 436, Bakersfield, Calif. It has a rotatable spool and a special hook on its noggin. Cord is reeled off the spool to the approximate length wanted, and slipped into the hook on the noggin which holds the bob centered. The bob can then be moved up and down for micrometer adjustment by rotating the spool.

The bob is being made in 10, 12, 14, and 16-ounce sizes. Construction is of forged brass with a steel point. Capacity of the spool is 30 feet of cord.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 30.

Forms for Concrete Pipe

Steel forms for concrete-pipe construction are described in a folder issued by the Concrete Forms Corp., 43 Cedar St., New York, N. Y. These forms may be used to make pipe for sewers, culverts, drains, irrigation purposes, etc.

They are available, the folder says, for standard or special-size pipe of any diameter, thickness, or length, with tongue-and-groove or bell ends, reinforced or plain, for wet or hand-tamp process. The form jackets are made in single units with heavy-duty hinges which are said to join the halves tightly together. Non-clog wedge bolts are used to lock the jackets together.

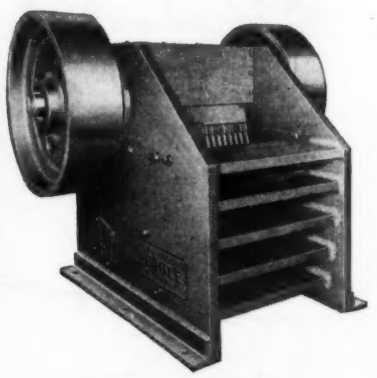
The catalog illustrates applications for the Atlas forms. It also gives a table of specifications and dimensions for heavy-duty reinforced-concrete pipe.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 87.

USE EAGLE EQUIPMENT

PULVERIZING—CRUSHING—MATERIAL HANDLING

Pulverizer Model 12-24



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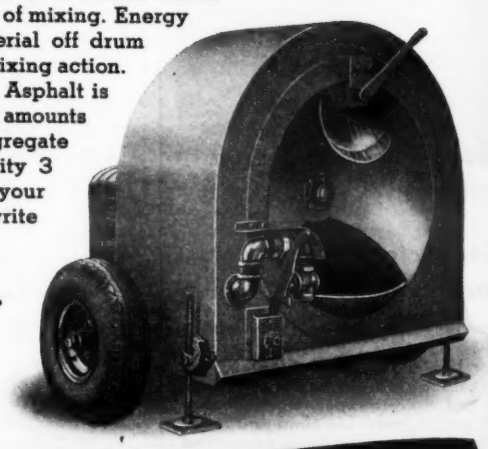
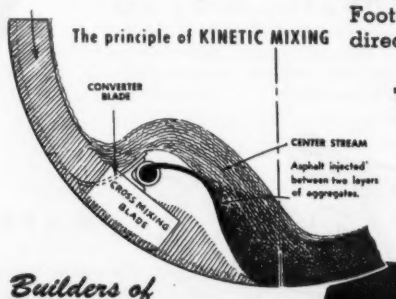
MAKES THE SMALL ASPHALT JOBS Profitable!

Centrifugal force of revolving drum holds material against inside drum face. Linear travel stores up kinetic energy to do the work of mixing. Energy converter blade (see diagram) peels a stream of material off drum face, slowing speed of material, and creating powerful mixing action. Cross-mixing blades cause side-to-side mixing action. Asphalt is sprayed into material beyond conveter blade in metered amounts — up to 8 gallons in 6 seconds. Every particle of aggregate gets complete, uniform asphalt coating — fast. Capacity 3 cu. ft. in 30 seconds! Ask your Foote Dealer for details or write direct for Bulletin K-100.





THE FOOTE CO., INC.
1916 STATE STREET
NUNDA, N. Y.

(Also see page 30)

Builders of
Adnun Black Top Pavers,
MultiFoote Concrete Pavers
and Foote Kinetic Mixers

FOOTE Kinetic mixer

Five-Man Crew Builds A Small Concrete Span

Truck-Mixers on 14-Mile Haul Help a Contractor Finish on Time Despite Shortage of Man-Power

✦ THE lack of man-power in a sparsely settled section of Sagadahoc County, Maine, did not prevent the Hector J. Cyr Co. of Waterville, Maine, from constructing a reinforced-concrete bridge according to schedule. With good cooperation from a five-man working force, and by using truck-mixed concrete to eliminate a mixing crew, the contractor finished the 12-foot-span structure within the allotted 65 working days.

The Maine State Highway Commission awarded the job to the Cyr brothers, Hector and Ferdinand, on a low bid of $13,907.25. The project was located in the town of Bowdoin about 2 miles west of U. S. 201 on State Route 125, an 18-foot bituminous-treated road. Besides eliminating a bad curve in the highway, the improvement replaced a narrow outmoded bridge constructed of stone abutments with log stringers as floor beams and a deck of 3-inch planking. The new modern concrete structure is designed for H-15 loading.

Traffic had to be maintained on this east-west highway during construction, so the contractor built a temporary wooden bridge across Blacksmith Shop Brook just north of the original structure. This 40-foot temporary bridge was made up of five bents on 10-foot centers. Each bent consisted of four 8 x 8-inch posts about 14 feet high, set on ledge rock. The posts were capped with 8 x 8's, 16 feet long, and supported nine 8 x 8 stringers. A deck of 3-inch planks was nailed to the stringers and on top of that floor, track planking was laid, each track made up of four 3 x 8's. A wood curb guard and handrails rounded out the well built span.

Bridge Substructure

The east abutment of the new bridge and part of the west abutment, including both wings, rest on ledge rock. These were anchored to the ledge by drilling 1½-foot holes in the rock on 2-foot centers, and grouting 1-inch x 3-foot steel dowels into the holes. The rest of the dowel length projected into the concrete. Drill holes in the rock were made with an Ingersoll-Rand Jackhamer powered by an I-R 110-cfm portable air compressor.

The channel for the brook, which runs about 4 feet deep when full, had to be diverted slightly because of the altered alignment of the bridge approaches. So holes were also drilled in the channel rock on 2½-foot centers and to a maximum depth of 6 feet. Atlas 40 per cent dynamite at the rate of ½ stick per hole was sufficient to blast open the ledge rock; from 10 to 15 holes were shot at a time. After the blast the material was excavated by a Bucyrus-Erie ⅜-yard shovel which also removed the old stone-masonry abutments of the original bridge. The shovel then dug a new channel 250 feet long x 10 feet wide with 1½ to 1 side slopes.

The excavated material was wasted on low ground on either side of the new stream location. At the time the excavation was made, construction of the new bridge had not progressed to the point where the material could be used as backfill. The fairly steep hills on either side of the old bridge were also eliminated by making the grade of the new span 4 feet higher than that of the old, and by placing 6 feet of fill on top of the new bridge and laying the pavement over that.

The west abutment, since it did not have a solid foundation of rock for the whole length, required a footing for a 26-foot section 7 feet wide x 3 feet deep. This went down about 4 feet below the bed of the stream and required a sandbag cofferdam which was kept unwatered by a 2 and 4-inch Gorman-Rupp pump. The abutments proper are 11 feet high and 6½ feet wide at the base. They have a batter of 1 inch to the foot on the face, and 4½ inches per foot on the back. They are flanked by 9-foot wings on a 45-degree angle.

Forms were built of 1¼-inch pine boards with butt joints. The boards came in random widths and lengths. The studs were spruce 2 x 4's on 16-inch centers, while the wales were double spruce 2 x 4's on 24-inch centers. No. 9 wire was used for form ties spaced on 2-foot centers each way.

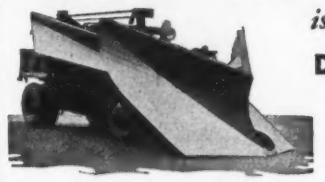
Reinforcing steel for the structure came from the South Portland, Maine, rolling mills of Bancroft & Martin Co.,

(Concluded on next page)

BRILLIANT PERFORMANCE EVERY TRIP OUT

is Assured by

DAVENPORT - FRINK SNO-PLOWS



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WELL POINT SYSTEMS

WILL DRY UP ANY EXCAVATION

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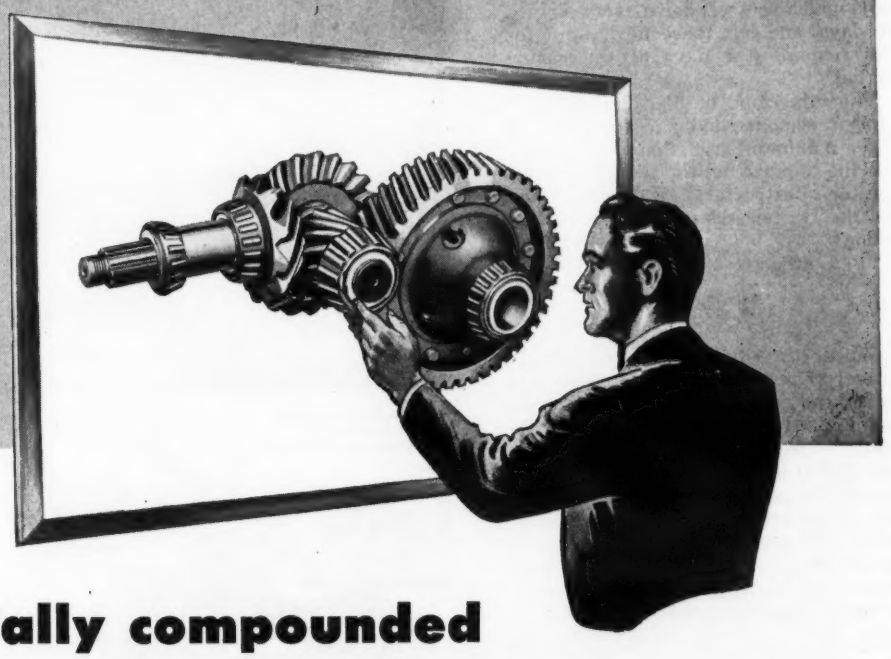
NEW

STANDARD HEAVY DUTY GEAR LUBRICANTS



. . . specially compounded for truck and bus differentials

Now you can get added protection for costly final drive and differential gearing on trucks and busses. Many truck operators and manufacturers have recognized the need for a lubricant especially designed for the high-torque loading encountered in truck and bus rear axle applications.

New Standard Heavy Duty Gear Lubricants fill this need. There are three grades available—No. 80, No. 90 and No. 140—providing a range of lubricants to meet seasonal operating requirements in various heavy duty services. The No. 80 and No. 90 grades meet the exacting requirements of U. S. Army Specification 2-105B. The No. 140 grade, although not a part of this specification, passes the same performance tests as the other two grades. Each of these lubricants is made of a balanced blend of stable base oils with high viscosity index and contains a special additive. This combination gives a non-corrosive lubricant possessing excellent extreme pressure characteristics.

These all-purpose lubricants are particularly adaptable for use in truck and bus final drives—both hypoid and spiral bevel gears—but also have other recommended applications—in transmissions, steering gears, fluid-lubricated universal joints, etc. A Standard Automotive Engineer will help you test this new line of maintenance-reducing gear lubricants.

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

Five-Man Crew Builds Small Concrete Span

(*Continued from preceding page*)

which delivered it to the job site by truck after a 40-mile haul.

Concreting

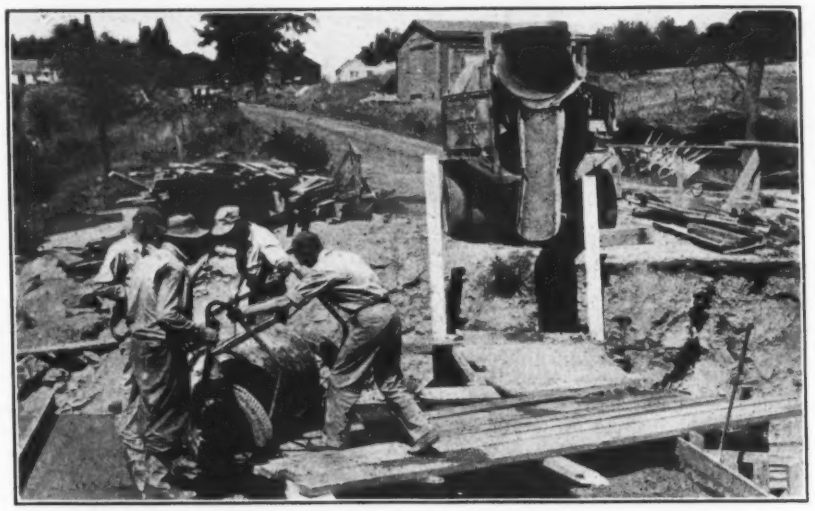
Truck-mixed concrete was used completely in pouring the bridge. The Lewiston Crushed Stone Co. of Lewiston, Maine, delivered the concrete in three Rex Moto-Mixers of 2-yard capacity mounted on Ford trucks after a 14-mile haul from the plant at Lewiston. In pouring the abutments, the truck-mixers chuted the concrete directly into the wall forms from their elevated position on the old road at each side of the bridge. When the slab was being poured, the concrete was discharged into a couple of ¼-yard buggies on rubber-tired wheels. These were then pushed out on a wood-plank walk and dumped by hand.

The entire east abutment was poured first, followed by the southern half of the west abutment. The southern half of the 15½-inch deck slab was poured next, and after it was allowed to cure for two weeks traffic was sent over it. Then the temporary bridge was removed and the remainder of the west abutment was poured and the slab completed. The abutment forms were left on for 7 days after the pour, while the timber falsework under the deck was not removed until 14 days later. The abutments were cured with wet burlap. The slab was covered with 3 inches of sand which was wet down every day for 10 days, and left there to dry out for the remaining 4 days of the curing period.

The mix came in 12-bag batches of Dragon cement, sand, and gravel which had a maximum gradation of 1¼ inches for the superstructure and 2½ inches for the substructure. A typical batch for the two classes of concrete was as follows:

	Abutments	Deck
Cement	1,128 lbs.	1,128 lbs.
Sand	2,640 lbs.	2,520 lbs.
Gravel	4,680 lbs.	4,440 lbs.

When the bridge was completed, gravel was excavated from a pit ½ mile away and hauled to the site in four small hired trucks. A Caterpillar D6 tractor-dozer helped with the backfilling against the abutment walls, and also spread the gravel to complete the fill on top of the bridge. The approaches totaling 700 feet were then built up to grade with an 18-inch gravel base course of material passing a 4-inch screen. This was topped by a 2-inch gravel surface course with material passing a 1¼-inch screen. The upper layer of gravel, 18 feet wide, was then given a surface treatment. Koppers Co. applied 0.6 gallon of tar per square yard —0.4 gallon for the first application, 0.2 gallon for the second. Gravel passing a 1-inch screen was spread over each application and dragged. Approach shoulders are 3 feet wide.



C. & E. M. Photo

A Rex Moto-Mixer of 2-yard capacity, mounted on a Ford truck, has just chuted concrete for a bridge deck into a ¼-yard rubber-tired buggy. Members of the 5-man crew push it out on a wood-plank walk and dump it by hand.

Quantities and Personnel

The major items included in this state highway contract, final cost of which was $13,517.91, were:

Excavation	1,200 cu. yds.
Borrow material	800 cu. yds.
Gravel base course	800 cu. yds.
Gravel surface course	105 cu. yds.
Tar	850 gals.
Concrete	233 cu. yds.
Reinforcing steel	6,350 lbs.

Hector J. Cyr directed the operations of his five-man crew working a 44-hour week. Laurence F. Decker was Resident Engineer for the Maine State Highway Commission which is headed by Lucius D. Barrows, Chief Engineer. Max L. Wilder is Bridge Engineer.

Buy U. S. Savings Bonds regularly.

SAVE 50% to 60%
NEW TRUCK TIRES

Low-Bed Trailer Tires

8.25-15 Goodyear 14-ply .....$39.25 ea.
(Reg. List Price $101.48)

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Heavy-Duty Truck Tires

14.00-20 Firestone 16-ply .....$145.00 ea.
(Reg. List Price $291.58)

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(Reg. List Price $309.64)

BRAND NEW
FIRST QUALITY
RAYON CONSTRUCTION
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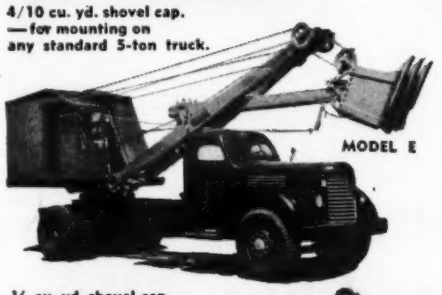
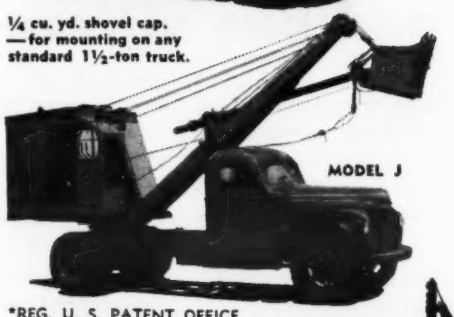
CONVERTIBLE, PROFIT-MAKING
"QUICK-WAY"*
TRUCK SHOVELS

4/10 cu. yd. shovel cap. —for mounting on any standard 5-ton truck.



¼ cu. yd. shovel cap. —for mounting on any standard 1½-ton truck.



*REG. U. S. PATENT OFFICE

One day you want a power shovel, the next it may be a dragline, clamshell, crane, pile driver or trench-hoe. Whatever the job calls for, you can convert a **"QUICK-WAY"** from one to another in *minutes*, not hours. Balanced design for truck mounting guarantees equally high performance for all of these uses—and when you move to the next job you can travel at the *truck's top speed*.

Interchangeability of parts, simplicity, fast operation, easy adjustment and repair, low maintenance, are still more reasons why a **"QUICK-WAY"** always pays off.

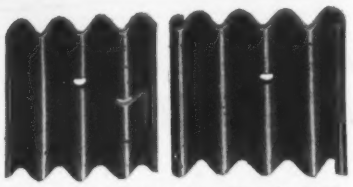
Materials and skilled labor costs are now at the all-time high. Yet **"QUICK-WAY"** Truck Shovels are priced only 10% above 1941 —3½% below the old OPA ceiling. Savings realized thru stepped-up production lines have made it possible to keep **"QUICK-WAY"** prices *down*.

Regardless of what larger equipment you own, you need **"QUICK-WAY"** Truck Shovels too. They're money makers!

Service available from our Distributors, strategically located throughout U.S. and worldwide.

"QUICK-WAY" TRUCK SHOVEL CO.
DENVER, COLORADO

First to build power shovels for truck mounting; still the leader after 28 years



Caine Corr-Plate steel piling is now judged one-fourth stronger per pound than before by its manufacturer. It is made from a new high-strength steel alloy and is said to be 25 per cent stronger than the same piling made of mild steel.

High-Strength Piling

Steel piling made from a new high-strength steel alloy is in production at the plant of the Caine Steel Co., 1820 No. Central Ave., Chicago 39, Ill.

According to the company, a series of bending, compression, and tensile-strength tests have shown piling made of the new alloy to be 25 per cent stronger than the same piling made of mild steel. This means, the company points out, that equal strength is available in a 25 per cent lighter piling. Other tests are said to have shown that the new alloy has twice the corrosion resistance of mild steel. Caine Corr-Plate steel piling is now judged one-fourth stronger per pound than before by its manufacturer.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 14.

Centerless Grinder

A centerless wet-belt grinder is the latest addition to the line of wet-belt machines manufactured by Porter-Cable Machine Co., 1714 No. Salina St., Syracuse, N. Y. Its endless abrasive belt operates over a resilient contact roll. The manufacturer claims that work is done by the belt and that the contact roll gets little if any wear; this is said to result in its remaining flat across and square at the corners. A swivel head is provided for truing up the contact roll, when necessary, in its normal position on the machine.

The grinder will handle short pieces, ¾-inch to 2-foot lengths and longer, if properly supported. It will handle circular pieces ranging from 3/32 to 2¼ inches in diameter.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 42.

Welding-Equipment Data

A 16-page catalog which describes its line of welding equipment is available from the Victor Welding Equipment Co., 844 Folsom St., San Francisco, Calif. Form 20, printed in color and illustrated throughout, contains information on the Victor large-capacity unit WC-1; the medium-capacity units WC-2 and WC-3; the J-type torches for light-gage welding; and the general-cutting unit C-1. Also discussed is Victor's line of hand-cutting torches and safety regulators.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 62.

Bituminous Distributor

Features of its bituminous distributors are pointed out in Bulletin N 41 issued by the Brokol Mfg. Co., Inc., 94 Madison St., Newark, N. J. The bulletin lists eight features and the construction details of the Brokol units. Each of the major parts is described in detail and all specifications are given.

The center-page spread shows a rear view of the unit in order to point out the control system and the spray equipment. It has six sectional views to aid in this discussion, and also one of the foot-pedal arrangement for lifting the extension bars.

The last two pages contain photographs of other Brokol products. These include tank-car heaters, supply tanks, heating kettles, sweepers, sand or chip spreaders, bitumen heaters, and others.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 65.

Hydraulics Text Revised

The publishers have announced a revised second edition of "Hydraulic Measurements" by Herbert Addison. Printed in Great Britain, it is being distributed in this country by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Mr. Addison is Professor of Hydraulics at Fuad I University, Giza, Egypt.

The first edition of this book was published in the United States in 1941, and the second maintains the organization and purpose of that edition. Many revisions have been made, however, and 17 new sections have been added; they are intended chiefly for users of various sorts of liquid meters. The book sells for $5.00.

Dallett's Contractor Tools

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DALLETT'S Line of Contractor Tools are made under rigid standards and from the material best suited for their intended applications. Dallett's quality tools will always give top performance.

Write for Bulletin C-220

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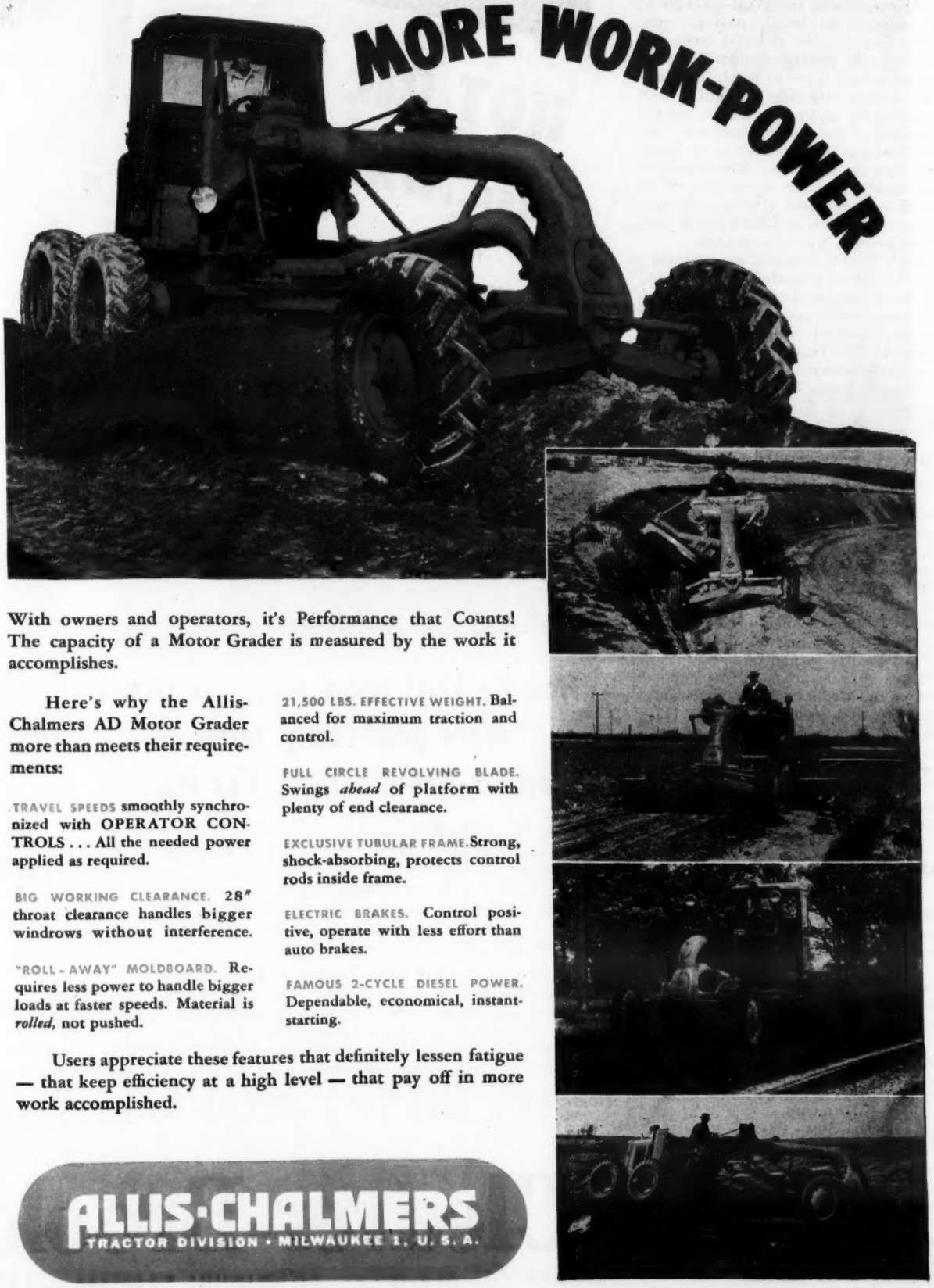
Manufacturers of Pneumatic Tools and Accessories
DISTRIBUTORS in principal cities throughout the United States, Canada, Europe and South America.

MORE WORK-POWER



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Here's why the Allis-Chalmers AD Motor Grader more than meets their requirements:

TRAVEL SPEEDS smoothly synchronized with OPERATOR CONTROLS . . . All the needed power applied as required.

BIG WORKING CLEARANCE. 28" throat clearance handles bigger windrows without interference.

"ROLL-AWAY" MOLDBOARD. Requires less power to handle bigger loads at faster speeds. Material is *rolled,* not pushed.

21,500 LBS. EFFECTIVE WEIGHT. Balanced for maximum traction and control.

FULL CIRCLE REVOLVING BLADE. Swings *ahead* of platform with plenty of end clearance.

EXCLUSIVE TUBULAR FRAME. Strong, shock-absorbing, protects control rods inside frame.

ELECTRIC BRAKES. Control positive, operate with less effort than auto brakes.

FAMOUS 2-CYCLE DIESEL POWER. Dependable, economical, instant-starting.

Users appreciate these features that definitely lessen fatigue — that keep efficiency at a high level — that pay off in more work accomplished.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

To keep your drop-hammer hoist rope from twisting or kinking after the impact, try using an ordinary welded chain as a rope terminal. It will take the sudden slack without twisting and so hold the line steady.

Chain Prevents Kink In Drop-Hammer Rope

Operators who use skull-crackers or niggerheads to break paving, rock, scrap, slag, or other material, know that the common trouble encountered with the hoist rope is not so much the shock and torque attendant to lifting and dropping the hammer. Rather, it is the tendency of the rope to twist and kink when released of all tension as the hammer hits the material. Momentum of the hoist line makes it continue in its travel for 6 or 8 feet, after the hammer impact. And it is this slack in the rope which permits it to twist or kink.

Much of this difficulty can be overcome by the use of preformed wire rope. But one operator is said to eliminate wire-rope twist completely by using ordinary welded chain as the rope terminal. The chain takes the sudden slack without twisting and so holds the line steady, free of all tendency to twist or kink.

Power Plants Have Automatic Controls

New control equipment for its electric light plants is now being offered by the Universal Motor Co., 428 Universal Drive, Oshkosh, Wis. These controls are of the fully automatic type. It is said that, with them, the power plant will start any time a load is placed on the line and will continue to operate until the last load is turned off.

These controls are standard equipment on the Model 2500-BA power unit which provides 2,000 to 2,500-watt, 115-volt, single-phase, 60-cycle alternating current. It is powered by the Universal 2-cylinder 4-cycle water-cooled engine.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 29.

Three District Managers Named by Air Reduction

Three changes in its district organization have been made by Air Reduction Sales Co., New York City. Emmett W. MacCorkle, Jr., has been appointed Portland, Oreg., District Manager. This district encompasses the entire state of Oregon, the southern half of Idaho, and the Walla Walla vicinity of Washington.

L. A. Hamilton has been appointed Manager of the Seattle District, which includes Montana, almost all of Washington, and the northern part of Idaho.

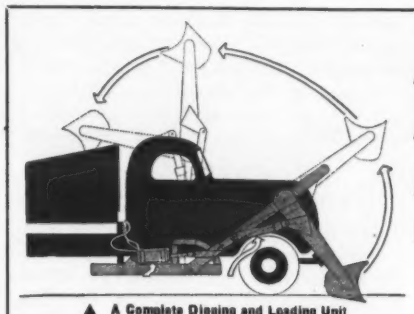
Herman Van Fleet, Jr., has been appointed Manager of the New England District, covering Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, and the eastern third of Connecticut. Mr. Van Fleet's headquarters will be at 122 Mt. Vernon St., Boston, Mass. In addition to his sales function, he will be in charge of Air Reduction plants at Boston; South Portland, Maine; and Central Falls, R. I.

Davey Dealer in Northwest

A dealer for the northwest territory has been appointed by Davey Compressor Co., Kent, Ohio. Inland Diesel & Machinery Co., E. 7th and 3rd Ave., Spokane, Wash., will handle the complete Davey line. Inland's sales territory comprises Washington, east of and including the counties of Okanogan, Chelan, Kittitas, Yakima, Klickitat; Idaho, north of Valley and Adams Counties; and northwestern Montana.

Cement Firm Ups Whitman

Frank J. Whitman has been appointed Sales Manager for the Chicago territory by Universal Atlas Cement Co., United States Steel Corp. subsidiary. Mr. Whitman, formerly Assistant Sales Manager for this territory, succeeds Edward Quebbeman who has retired after 51 years with the company.



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FAST EFFICIENT LOADING IN ONE OPERATION

Years of research and grueling service have proved the ability of the Owen Loader to stand up under the toughest digging and loading jobs. Easily mounted on standard trucks and tractors. Write for detailed information on how it will speed loading on your jobs.

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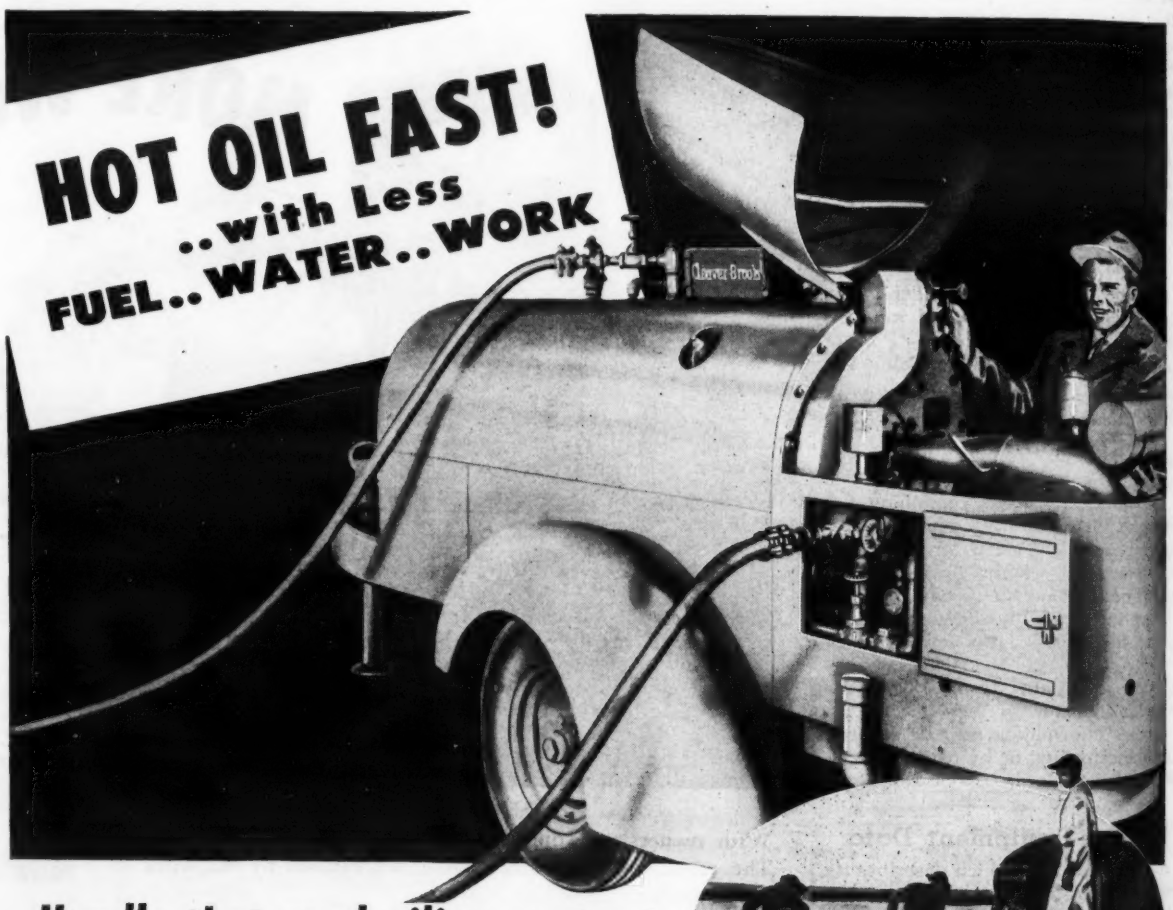
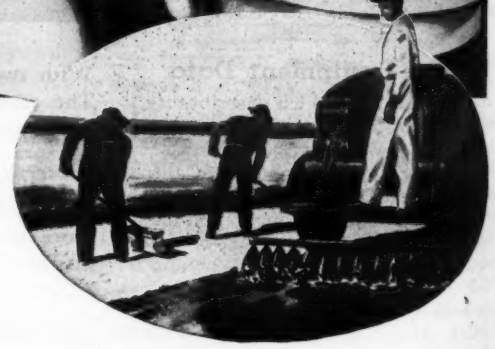
MARION, NORTH CAROLINA

HOT OIL FAST! ..with Less FUEL..WATER..WORK





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The quicker you get the oil or asphalt in the tank car on the siding up to application temperature and flowing into the distributors—the faster your road crews can get going and finish the job.

With a Cleaver-Brooks Tank Car Heater you can have hot, dry steam flowing to car coils from a cold start in 20 minutes or less. And you can keep going all day with the least work and bother because a Cleaver-Brooks Tank Car Heater requires less fuel and water.

Perfected — highly efficient — you can tow it with car or truck to tank car siding, construction site, material yard or other locations where you need steam.

The famous Cleaver-Brooks four-pass fuel travel means low fuel consumption; the turbine type condensate return system cuts water loss — every drop of condensate goes back to the heater under pressure.

Built for full capacity — full time work — Cleaver-Brooks Tank Car Heaters will give you the most in production hours on the job. Write for bulletins and complete information.

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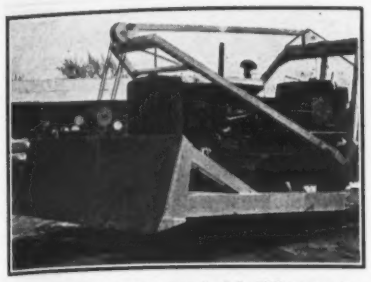
Write On Your Business Letterhead . . .
For the Bituminous — mix Calculator — a ready reference slide rule showing weight of mix needed in lbs. and tons in relation to width and depth of area to be covered.

Cleaver-Brooks PIONEERS AND ORIGINATORS OF

TANK CAR HEATERS . . . BITUMINOUS BOOSTERS . . . AUTOMATIC STEAM-PLANTS



The Arrow cable-operated bulldozer can be lifted 44 inches above the ground. It is made in two styles for either frame or track mounting.

Bull, Angle Dozers Are Cable-Operated

Cable-operated straight and angle dozers for medium and heavy-duty tractors are among the products of the Arrow Mfg. Co., P. O. Box 4120, So. Denver Station, Denver 9, Colo. They are made in two styles; frame mounted or track-mounted.

The angle dozer is designed to angle 22 degrees to the right or left, and the tilt of the blade can be regulated to 12 inches above the horizontal. The bulldozer has a lift of 44 inches above the ground.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 1.

New Winch Offers A Choice of Power

Utility winches powered by air, electric motor, or gasoline engine are made by the Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, N.Y. These winches are available for either permanent installations or portable work. They can be used for hoisting or to move loads anywhere within 1,100 feet of the operating point.

The air motor is of the reversible vane type without reciprocating parts, fastened to the winch with a standard NEMA flange mounting. This mounting permits interchange from air to electric-motor drive; it also allows bolting the air motor in any of four positions on the winch. For electric power, the winch is provided with a standard make of NEMA flange-mounted ball-bearing motor. For gasoline operation, a self-contained Wisconsin 4-cycle engine is provided.

The winch has three controls. The clutch lever engages and disengages the motor from the drum, whose speed is variable. The brake lever is used to hold the load, although it can also control the lowering speed. The safety lock provides a positive mechanical lock against drum rotation. This is disengaged during normal operation. The air and electric-driven winches may be reversed; the gasoline-driven winches are non-reversible.

Speed of the drum at rated capacity (with 80-psi air pressure) is 125 fpm. Drum capacity for the standard winch is 700 feet of ⅜-inch wire rope or 400 feet of ½-inch rope. For the long drum, it is 1,400 feet of ⅜-inch rope, or 800 feet of ½-inch. Working capacities are about 22 per cent less than these maximums. Capacity of load in pounds is 2,000 for the air and electric, and 1,500 for the gasoline models.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 86.

Cummins Elects Officers

At a recent stockholders' and directors' meeting of the Cummins Engine Co., Inc., Columbus, Ind., C. L. Cummins was elected Chairman of the Board of Directors, and J. I. Miller was elected President of the company.

Mr. Cummins founded the company in 1919 and has been with it ever since. Mr. Miller joined Cummins in 1934 and has served as Vice President and General Manager.

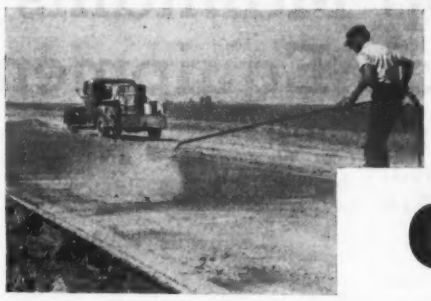
Asphalt-Paving Catalog

Detailed descriptions of types of asphalt paving in which asphalt and aggregate are mixed in a plant are set forth in a booklet recently put out by The Texas Co., Asphalt Sales Department, 135 E. 42nd St., New York 17, N. Y. This booklet covers the proper procedure and materials to be used in the construction of sheet asphalt, sand asphalt, and the various types of hot and cold-laid asphaltic-concrete paving. Also included is helpful information on the correct method of unloading asphalt from tank cars.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 100.

Fabricated-Steel Sales Mgr.

Boyd O. Bach is the new Sales Manager of fabricated steel construction at Bethlehem Steel Co., Bethlehem, Pa. He succeeds Charles A. Johnson who is retiring.



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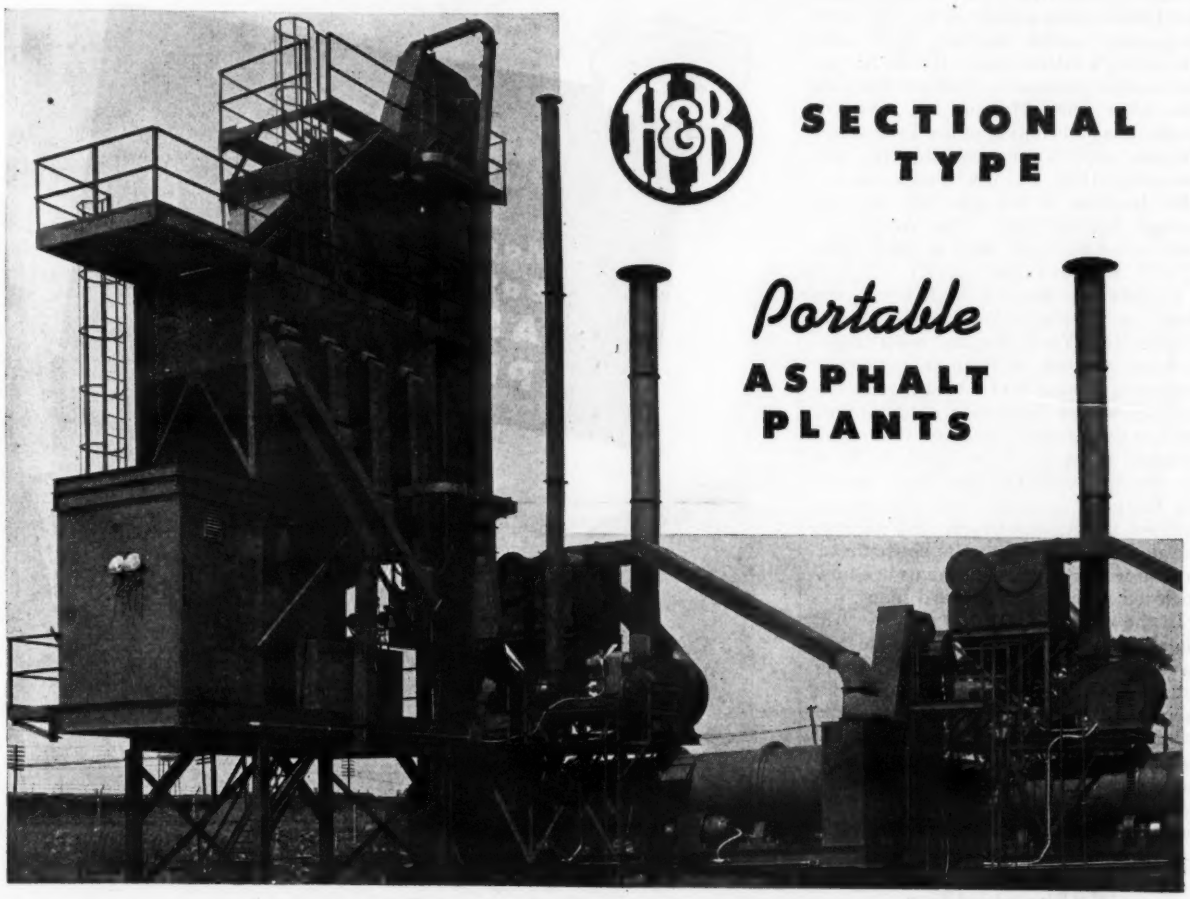

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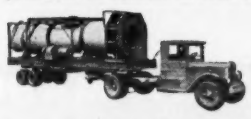

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H & B sectional type plants are built in two general models: Model PE electrically-driven plants, recommended primarily for contractors who do not ordinarily move more than once or twice a season; Model PA plants, designed primarily for the contractor who moves frequently and who must be able to get efficient production on small as well as large jobs, and under a wide variety of operating conditions.

Bulletin P-46, describing both PE and PA plants, will be sent on request.

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Large Shop Maintains Tunnel-Job Equipment

Muck Cars Are Overhauled, Drill Bits Are Sharpened, Locomotive Batteries Are Charged at Shop on Site

✦ ON any major tunnel job there is as much activity going on above ground as there is below the surface—if not more. It is needed to maintain the equipment and tools for constructing one of these modern engineering wonders. It is especially needed when old equipment must perforce be used because a war stopped the manufacture of new machines, and when many replacement parts must be made since they cannot be obtained.

Such is the situation at the Manhattan end of the Brooklyn-Battery Tunnel where Mason & Hanger Co., Inc., of New York City has a $16,000,000 contract. It is driving a twin-tube vehicular tunnel from a shaft in Battery Park to a point under the East River near Governor's Island; there it will be met by another contractor working from the Brooklyn side. The project, which is under the jurisdiction of the Triborough Bridge and Tunnel Authority, was started in 1940. But it was suspended in 1942 because of the war and was resumed late in 1945. The completion date is set for some time in 1949. (See C. & E. M., April, 1947, pg. 2.)

Picturesque Battery Park where the East and Hudson Rivers empty into Upper New York Bay has been transformed necessarily from a sightseers' stamping ground into a hustling hive of activity where derricks are silhouetted against the harbor's horizon. Room still remains at the southern tip of the Park for the Staten Island ferries to berth; the Statue of Liberty boats still run to Bedloes Island; but people and pigeons can no longer idle away the hours there, for the walks and grassy lawns are now enclosed within a high board fence.

In the middle of the old park several plain buildings of utilitarian aspect have arisen in which the above-ground activities of the tunnel contractor are carried on. The long wharf, where the Sandy Hook steamers and the show boats for moonlight cruises formerly moored, has nearly all been taken over by the builders. And at one end of the former park a huge pile of muck testifies to the excavating activity of sand hogs blasting and boring their way through Manhattan schist far below the bed of the East River.

Contractors' Buildings

Among the new buildings erected by Mason & Hanger are the engineering office, timekeeper's office, a 20 x 50-foot first-aid station, and a 30 x 60-foot 2-story concrete-block hog house where the sand hogs change their clothes. These four structures are heated by an oil burner located in a lean-to beside the hog house. Of the others, the two largest are the powerhouse and maintenance building, each 60 x 100 feet and constructed of Blaw-Knox metal panels in 2-foot sections.

Other key buildings are a 30 x 40-foot blacksmith shop where bits are forged and sharpened; a 20 x 30-foot bolt-storage building; a small structure housing the battery-charging equipment; and one of the park buildings

(*Continued on next page*)

C. & E. M. Photo

This Gardner-Denver DF-1 oil-burning furnace in the blacksmith shop heats drill steel used on the Manhattan end of the Brooklyn-Battery Tunnel. The furnace will accommodate 20 pieces at a time.

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AND CUTTING EDGES

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Motor Graders, Maintainers, Scrapers, Drags, Bulldozers, Backfillers, Wagon Scrapers, Trail Builders, Trail Blazers, Carryalls. Also—

CUTTING EDGES
WEARING BOOTS
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EXTENSION BLADES
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SCARIFIER TEETH

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All widths lengths, and thicknesses. Punched ready to fit your machine.

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Large Shop Maintains Tunnel-Job Equipment

(*Continued from preceding page*)

which was not razed. The latter is a hexagonal-shaped brick building, 40 feet in diameter, with brick walls and tile floor; it was formerly used as a refreshment stand. Partitions now divide it into three different sections: drill-repair shop, welding and cable-splicing shop, and cable storeroom.

The big maintenance building with a concrete foundation floor, metal sides and roof supported on steel trusses, houses a machine shop, general repair shop, storeroom, electrical shop, and three small offices—one for the machine-shop records and files, and the other two assigned to the Master Mechanic and Electrical Superintendent.

Machine Shop

A 40-foot-square area at one corner of the building has been partitioned off by Celotex board as a machine shop. Partition boards have also been erected to form a ceiling over this section, since the great height of the main building is not required in the machine shop. Thus the enclosed portion is more efficiently heated and lighted. Heat is supplied by two pot-belly coal-burning stoves; eight overhead lights furnish good illumination aided by the light-colored walls and ceiling. A fluorescent light is also hung over each of the two big lathes. The shop is entered from the outside through a 12-foot-wide folding metal door. On the opposite side of the room two 6-foot-wide x 8-foot-high sliding wooden doors lead into the general repair shop.

Along one end of the machine shop are a long wooden workbench and a steel cabinet for the storage of small tools. On the opposite end a large 200-ton hydraulic press has been set up on which such heavy machine parts as bushings, gears, wheels, axles, etc., can be pressed and fitted. The press uses oil in its pumps and is driven by a G-E 15-hp motor. Work is lifted to the press by means of a Union 3-ton overhead hoist hung from a roof truss.

In a neat row down one side of the shop are such standard machine-shop equipment as a Cincinnati-Bickford 48-inch radial drill driven by a Crocker-Wheeler 10-hp motor; a Marvel No. 9A high-speed ball-bearing saw powered by a G-E 7-hp motor; and a Jarecki No. 66 pipe-threading machine operated from a Wagner 3-hp motor. This unit will cut and thread pipe from 1¼ up to 6-inch diameter.

In the opposite corners are the two big lathes—an American, having a 26-inch swing and a 12-foot bed with a 10-hp motor; and a LeBlond, 20-inch x 15-foot, driven by a 15-hp motor. Over the first lathe a Yale 1-ton hoist has been hung to facilitate the work.

The units are well laid out so that ample working space is available around each machine. Other equipment includes a Gould & Eberhardt shaper with a 28-inch stroke operated by a 10-hp motor; a Champion 20-inch drill, with a 1-hp motor; an Autostart grinder and buffer with a 2 x 16-inch wheel with a 3-hp motor; an Acme bolt-making and pipe-threading machine, ⅜ to 2-inch capacity, driven by a 5-hp motor; and a Watson-Stillman hydraulic pipe and conduit-bending machine which will take diameter sizes up to 5 inches.

Three machinists are employed in this shop. And because of the inability to purchase new equipment or even replacement parts for the old, their work is all-embracing in scope. Here chrome-nickel-steel shafts and bronze bushings are turned out for the four mucking machines used in the tunnel; while two mucking machines are at work, two others are kept in reserve ready to go into action as replacements. For greater strength, the size of their shafts has

(*Continued on next page*)

We've "short-cut" our short hauls!

Those short hauls on a dirt-moving or fill job used to be a real headache for us. But not any more since our Oliver "Cletrac" dealer showed us how we could "short cut" them.

We were talking the situation over one day when he came up with this. "Look," he said, "on those short hauls you can save a lot of time by equipping your Cletracs with Drott Bull Clam Shovels. You see, these units can act as a bulldozer and scraper combined . . . at a lot lower operating cost and in a lot less time. They scrape up the dirt, carry it in the bowl direct to the dumping point. They travel straight ahead with no time out to change position for loading or unloading. There's no loss of material en route and the unit levels the surface ahead of the tractor when it loads and when it's traveling. The operator can regulate the depth of cut from his seat. This unit doesn't dig a hole to fill a hole. The blade can be tilted horizontally to either side to get a straight cut, even on uneven ground."

Let me tell you they really short-cut our short hauls. The Oliver "Cletrac" dealer sure is a big help to us. He's a good man to know!

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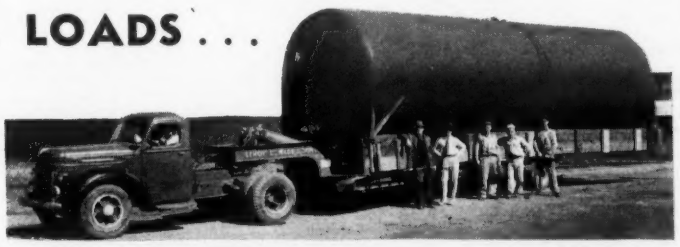

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CONTRACTORS AND ENGINEERS MONTHLY
470 Fourth Avenue
New York 16, N.Y.

C. & E. M. Photo

In the Mason & Hanger machine shop, a worker makes a 1½-inch bolt for a tunnel muck-car coupling on an Acme bolt-making and pipe-threading machine.

Large Shop Maintains Tunnel-Job Equipment

(*Continued from preceding page*)

been increased ½ inch over the standard. Shafts are also turned out for wheels and armature motors on the electric locomotives. Links and pins for drawbars and couplings of the muck cars are fashioned at this shop, as well as rods and bolts for the steel bents used in the pilot-tunnel bracing.

General Repairs

The front portion of the big maintenance building adjoining the machine shop is given over to the repair of muck cars. This 20-foot-wide section has a track laid down the center on top of the concrete floor so that the muck cars can be rolled in for overhauling. The track connects to the yard layout. Overhead is a 12-inch I-beam serving as a monorail and supporting two sets of chain falls, 3-ton Yale and Union, by which the muck cars are hoisted and shifted around.

Most of the repair work here is done by welding, especially on the muck cars which already have seen much service; they were purchased from contractors who had used them on the Delaware Aqueduct. Welding equipment on the project includes four G-E 300-amp electric welders mounted on 3-wheel carriages which are easily pulled about to any desired location (one is kept in the tunnel shaft), and ten oxyacetylene cutting and welding outfits. Five welders move about with these units, but a couple are usually assigned to the car shop where a welding outfit of each type is kept busy. Welding is done directly on the cars, or on metal worktables set up in the shop at the side of the track and enclosed by portable safety screens.

At the rear of the car shop the room widens out into a 40-foot L-shape, where pumps and the heavier electrical equipment are repaired.

The main building is divided midway of its length by a metal partition behind which is a storeroom 50 feet long x 40 feet wide. Here are the multitude of parts and supplies which must be on hand to keep this big tunnel job moving along smoothly. Row upon row of shelves and bins made of 1½-inch wood stock are sturdily constructed to hold the weight of their diverse materials.

About the only item missing of those usually associated with a construction job is gasoline. Equipment is either electrically, pneumatically, or hydraulically driven, except the Lima crane with a 60-foot boom which is used for handling material in the yard. This is run on diesel fuel which is brought into the yard a barrel at a time as needed.

The storeroom has two doors, one leading directly to the outside and the other into the car and pump shop. Parts and supplies are dispensed over a counter into the shop, while an enclosure has been built within the storeroom near the outside door where requisitions are also filled.

For general repairs on tunnel equipment 3 men handle spot repairs on pumps, one for each shift; 2 men on the day shift grease and service the Conway muckers; 15 known as maintenance men look after the pipes, cages, hoses, air lines, drill carriages, pumps, etc., with 10 of these assigned to the shafts and tunnels, and the others to operations on the surface.

Electrical Department

Partitioned off from the storeroom in the big maintenance building is a 20 x 30-foot electrical shop where small repairs are made at a wooden workbench. Large jobs, such as on motors or armatures, are done in the general repair or machine shops, while the electric locomotives are usually serviced at the top of the shaft. Armatures are sent out for winding.

Each 10-ton electric locomotive is operated by two motors on power furnished by Exide TL M 31 56-cell storage batteries. These are taken from the tunnel at the end of each 8-hour shift and re-charged on the surface. Two battery-charging units are housed in a small wooden building close to the shaft, with lead wires extending out to the batteries. Alternating current enters the building at 2,300 volts. It is stepped down to 440 volts by one set of transformers before going down into the tunnel to operate the mucking machines. Other transformers step the voltage down further on another line

(*Continued on next page*)

When equipped with a Mall Vibrator, one man can place more concrete than five hand puddlers. At the same time, the concrete placed is denser because a stiffer mix is used . . . is free of voids and honeycombs . . . and has a better bond with reinforcements and between successive layers. Its 1½ or 3 H.P. Gasoline Engine also operates tools for *Grinding, Sanding, Wire Brushing, Pumping, Drilling, Sanding and Sawing*—thereby keeping the unit busy all day long. Pneumatic and Electric models are also available.

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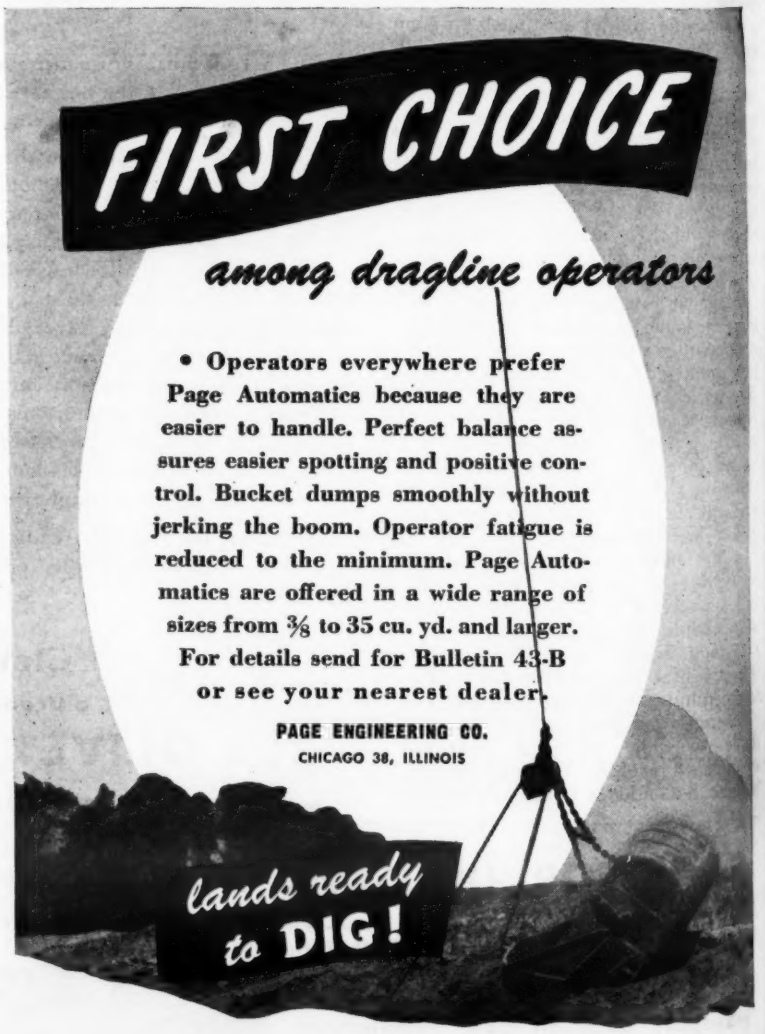
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DRAGLINE BUCKETS and WALKING DRAGLINES

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Large Shop Maintains Tunnel-Job Equipment

(*Continued from preceding page*)

to 220 volts for operating the shaft derricks and the battery-charging units.

One unit is an Electric Products motor-generator set. It consists of a 125-hp motor, driven by 220-volt ac, and connected by a shaft to a 75-kw generator which supplies dc to the batteries at 150 volts. The other set is a G-E 125-hp motor driving a Crocker-Wheeler 75-kw generator. Each set, controlled by its own switchboard, can charge four batteries at a time in from 5 to 7 hours. While the current flows into the batteries at a constant voltage, the charge tapers off as the internal resistance increases within the battery until the power is finally cut off when the charging is completed.

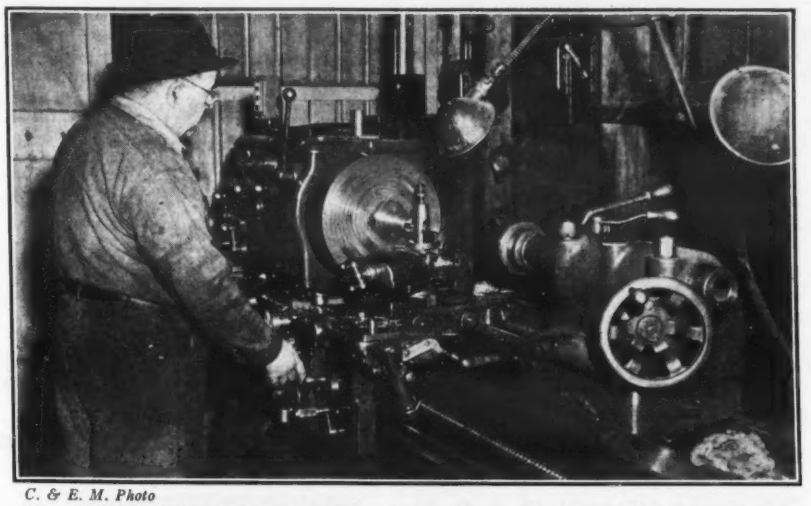
The electrical department has 30 men working over the three 8-hour shifts.

Drills and Bits

In one partitioned-off section of the old Battery Park refreshment stand, wire cable from ⅜ to 1-inch size is spliced and made into slings. Several makes of cable are used, including American Steel & Wire, Broderick & Bascom, Leschen, and Roebling. Both preformed and non-rotating are used, the latter primarily for the derrick hoists. An oxyacetylene and an electric welder are used in this shop. Cable reels are also stored in an adjoining room of the building.

The remainder of the structure is given over to the two drill "doctors" who maintain the Ingersoll-Rand 3½-inch DA 35 and 4-inch DA 505 drifters, Jackhamers, stoper drills, and vibrators. Parts are replaced or repaired here mostly with hand tools, but an I-R air grinder operated by a compressed-air line at 100 to 110-pound pressure from the powerhouse is available when needed. The drill steel used is 1¼-inch round with a ⅜-inch hole through the center for the passage of water, since wet drilling is employed exclusively. Forged bits are used on this job.

The forging of shanks and bits and all sharpening is done in the blacksmith shop. This is a 30 x 40-foot wooden building which also contains a 6-foot-square coal-burning forge with a valve-controlled air line from the powerhouse to serve as a blower. The forge is for general blacksmith work and is not used for the drill steel.



C. & E. M. Photo

On a LeBlond 20-inch x 15-foot lathe in the machine shop, a machinist makes bronze bushings for a planetary gear in the Conway mucker which Mason & Hanger is using on its Brooklyn-Battery tunnel contract.

The drill steel comes in 22-foot lengths. It is cut to the desired sizes by an I-R 500 air-driven drill-steel cutter and shank grinder mounted on a wooden workbench at one side of the shop. The cutter wheel is a 10-inch Manhattan Carborundum disk saw. The first lengths used in the drills are 3-foot, the shortest size, while the other lengths are usually 5, 7, 9, 11 and 13 feet. In the regular blast-hole drilling 13-foot lengths are the longest required, but in drilling test holes the full 22-foot steel is used.

Employed in the shop are four steel sharpeners and four helpers who sharpen or forge anywhere from 1,000 to 2,000 steel bits and shanks over a 24-hour day. At the present time three rounds are fired in each heading every 24 hours or a total of 6 rounds for both tunnels. Around 100 pieces of steel are used for each round, and two to three holes are drilled on an average without resharpening the bits.

The ends of the steel are heated in a Gardner-Denver DF-1 oil furnace which will accommodate 20 pieces at a time, and are then forged or sharpened in a Gardner-Denver Model 6 sharp-

(*Concluded on next page, Col. 2*)

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½ and ⅝ cu. yd. capacity.

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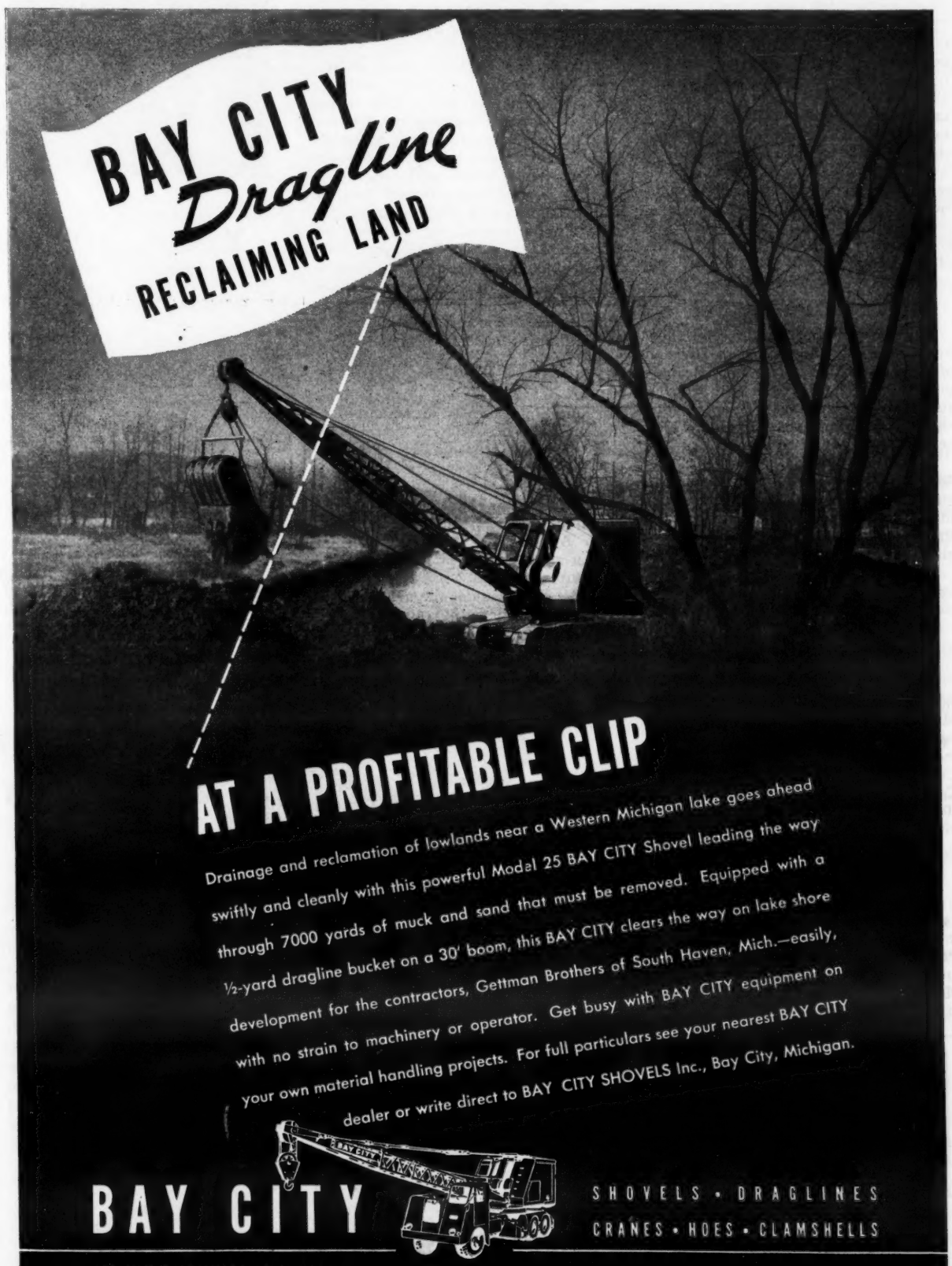

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SEE YOUR NEAREST DEALER for Bay City excavating and material handling equipment in sizes from ⅜ to 1¼ yards having crane rating up to 20 tons. Both crawler and pneumatic tire mounting.

This Sasgen hand winch is said to raise or lower at 20 fpm.

Scaffold Hand Winch

A scaffold hand winch with three safety devices is made by the Sasgen Derrick Co., 3101 Grand Ave., Chicago 22, Ill. Said to raise or lower at a speed of approximately 20 fpm, it comes equipped with 75 feet of ¼-inch wire rope. The winch drum will hold up to 130 feet of this size cable. In scaffolding a structure, the bails are set on 8-foot centers. The manufacturer claims that in actual tests the Sasgen winch was subjected to a strain of 8,020 pounds without impairment of working condition.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 9.

Wheel-Puller Set

A universal wheel-puller set is now being made by The Raybestos Division of Raybestos-Manhattan, Inc., Bridgeport, Conn. The Raybestos 501 set consists of five pullers said to fit all popular cars made in the past 15 years which require this type of equipment.

In addition to wheel pullers Nos. 429, 433, 439, 441, and 442, the set includes one power screw and varied-size thrust nuts. It is claimed by the manufacturer that its rigid one-piece power screw eliminates give or spring.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 45.

"Cap" Miller Joins Soulé

M. E. "Cap" Miller has joined Soulé Equipment Co. of Oakland, Calif. Mr. Miller was formerly Central Sales Manager for R. G. LeTourneau, Inc., and more recently was with Rozier-Ryan Co. in St. Louis. He is well known in California, for he got his start in the 30's when Stockton was headquarters for LeTourneau.

Moser to Minneapolis

The appointment of Daniel R. Moser as Minneapolis sales representative for the Columbia Chemical Division of Pittsburgh Plate Glass Co. has been announced by company officials. Mr. Moser joined the research department of the Columbia Division in 1938.

Complete line of
gasoline, pneumatic and electric driven
concrete vibrators and grinders
Write for information and prices
ROETH VIBRATOR COMPANY
1737 Farragut Ave. Chicago, Ill.

Large Shop Maintains Tunnel-Job Equipment

(*Continued from preceding page*)

ener. Two furnaces and two sharpeners are used, and the sharpeners have interchangeable dies so that either shanks or bits can be forged on the same machine. The heavy pounding of the air forges closes up the water holes both at bit and shank ends, but the machine is equipped with punches which ream them open to the original ⅜-inch diameter.

The 4-point bits are quenched in a water bath 6 x 4 x 4 feet deep. The shank ends, which do not need the same hard temper, are quenched in an oil bath 2 x 2 x 1½ feet deep, which is surrounded by a moat of running water to keep the oil cool. With a 2-man crew heating and forging, an average of 70 pieces of steel can be turned out in an hour, or better than one a minute. Before it is taken into the tunnel, every piece is tested by blowing air through the liner holes to make certain that the water hole is clear.

Outside the drill-sharpener shop a nipper car on a siding is loaded with the various lengths of steel. Two nipper cars are used in transporting the steel so that the jumbo is always adequately supplied. The cars have six pockets of varying depth which will take up to 13-foot lengths and carry a total of about 100 pieces. A few 22-foot lengths may also be carried for the test-hole borings. At the jumbo the nipper passes the steel lengths out to the chuck tender who raises them on a pneumatic hoist to the level of the drill platform. The chuck tender then replaces the steel in the drill with the sharpened piece.

Bolt House

Bolts for the cast-iron tunnel lining are stored in a 20 x 30-foot metal building with a concrete floor. For the light ring sections used in rock, the bolts are 1⅜-inch in diameter and weigh 5 pounds each. In the heavy ring sections, constructed in the softer material, 10-pound bolts of 1¾-inch diameter are used. At this shop the bolts are fitted with a steel washer at both the head and nut ends, and a rope washer or gasket is placed under the metal washers to bear against the ring segments. Hemp is used in the weaving of these rope gaskets which are known as grommets. They are soaked in red lead before being placed on the bolts, thus making the connection watertight when the bolts are taken up.

Personnel

Miles I. Killmer is Vice President and General Manager of the Mason & Hanger Co. and Howard L. King is Chief Engineer. Job personnel includes Allen B. Lincoln, Project Manager; John A. Ury, General Superintendent; Guy W. Sackett, Jr., Resident Engineer; E. S. Jermyn, Master Mechanic; and Frank Slipp, Electrical Superintendent. On an average, 75 men are employed on equipment maintenance.

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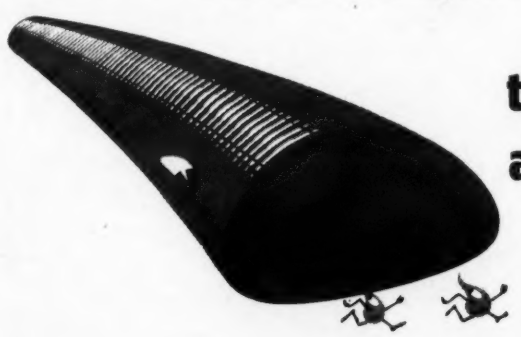

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Once you use ARMCO Pipe-Arch you'll be convinced. These sturdy structures have all the advantages of full-round corrugated pipe plus a functional design that meets specific drainage requirements. Write for complete information. Armco Drainage & Metal Products, Inc., 2405 Curtis Street, Middletown, Ohio.

ARMCO PIPE-ARCHES

Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Government Not Liable For Delay to Contractor

An engineering company furnished a road-building machine and crew to spread aggregate in the paving of an air base under a WPA project. The Government paid for the work on a production basis. The company sued for damages which resulted from delays attributed to the Government; the latter had failed to provide enough aggregate for the company to operate its equipment during two 8-hour shifts each day. (There was no clause in the contract requiring the Government to do so.)

Trial of the suit before the United States District Court for South Dakota ended in a dismissal. This decision was upheld by the United States Circuit Court of Appeals, Eighth Circuit, on the company's appeal (Northwestern Engineering Co. v. United States, 154 Fed. 2d 793). The higher court reasoned:

"The contract provided that the equipment furnished . . . [by the company] was 'to be operated at times and places designated by the Government's instructions', and provided for compensation based solely on production. Under this contract . . . [the company] could not recover for loss sustained as a result of delay, in absence of arbitrary or inexcusable failure or neglect on the part of" the Government.

The Government "in agreeing to furnish the aggregate and in requiring a machine having the capacity to mix and spread a minimum of 150 tons per hour, was under the implied obligation to proceed with the work with reasonable diligence." The Government "could not, without reasonable excuse, fail to furnish material to keep plaintiff's machine in operation, but time was not declared" in the agreement "to be of the essence, and the" Government's "duty to furnish sufficient material was not an absolute one. The court has no power to make a new and different contract for the parties."

After summarizing the evidence, the Court of Appeals decided that the delays were due to weather and climatic conditions, interference caused by use of the air base while the work proceeded, etc. All of these were beyond the Government's control. The Court added, in essence: When the bid was made, the company knew of the conditions under which the work would have to be performed and must be deemed to have contracted with a view to consequent delays.

Employee Assaults Fellow; Employer Is Held Liable

The Problem: A general contractor's employee injured a subcontractor's employee by throwing a hammer at him in a squabble arising out of the work being done on a building project. Was the contractor liable in damages to the injured man?

Answer of the California Supreme Court: Yes. (Carr v. Wm. C. Crowell Co., 171 Pac. 2d 5.) Said the court: "It is well settled that an employer is liable for wilful and malicious torts [wrongs] committed in the scope of the employment. . . Defendant contends that Enloe [the hammer thrower] was not acting within the scope of his employment when he injured plaintiff, on the grounds that the throwing of the hammer did not further defendant's interests as an employer. . . It is sufficient, however, if the injury resulted from a dispute arising out of the employment. . . The employer's responsibility for the tortious [wrongful] conduct of his employee 'extends far beyond his actual or possible control over the conduct of the servant. It rests upon the broader ground that every man who prefers to manage his affairs through others remains bound to so manage them that third persons are not injured by any breach of legal duty on the part of such others' while acting in the scope of their employment. . .

"If an employee inflicts an injury out of personal malice, not engendered by the employment, the employer is not liable."

Termination Notice Not Needed in Default Case

A Government contract provided that if the contractor defaulted in performance, the Government could issue a notice terminating the agreement. It could then take over the work and hold the contractor and his sureties liable for the excess cost of completion.

After the contractor's bid had been accepted and the Government had refused to permit its withdrawal, the contractor refused to perform. The Government wrote the contractor that he had defaulted and had thereby rendered himself liable to the Government for a specified sum.

In the Government's suit for damages for breach of the contract, the United States District Court for the District of Massachusetts decided: The Government's letter did not constitute a *notice of termination* of the contract, within the meaning of the clause providing for such termination. But, in this case, no such notice was necessary as a condition to taking over the work. The contractor had flatly refused to perform. In short, he himself, in effect, gave notice to the Government of termination of the contract by informing it that he would not perform. (U. S. v. Conti, 64 Fed. Supp. 187.)

The Government had let the contract to the third lowest bidder after the first's default and after the second withdrew his bid. So the court decided that the Government was entitled to collect from the defaulting contractor the excess of the cost of performance by the third bidder over the price bid by the defaulting contractor.

Items Disallowed to Dam Contractor as Job Extras

Delays in performance on a Federal dam project were due mainly to labor shortage; they were not attributable to breach of contract by the Government. Therefore the contractor was not entitled to extra pay (1) for repairs necessitated by a flood which took place during the delay, or (2) for increased costs of electric power, workmen's compensation insurance, unemployment and social-security taxes, and surety-bond premiums incurred during the delay period, or (3) for increased cost of gravel procured after the contract should have been completed, or (4) the rental value of the contractor's equipment while idle. So decided the United States Court of Claims in the case of York Engineering & Construction Co. v. United States 62 Fed. Supp. 546.

The court also decided that the Government was not liable for increased costs due to state and Federal social-security taxes paid under laws enacted after the contract was made. Furthermore, an order of Government engineers requiring that mortar be spread on all concrete surfaces before new concrete should be laid was not unreasonable, the court decided. And it did not entitle the contractor to extra pay. For the contract specified that, *where necessary* to secure an adequate bond, the surface of existing concrete should be cleaned and spread with a ½-inch layer of mortar.

Nor was the contractor entitled to extra pay for constructing expansion joints of cork and tar paper between all concrete monoliths. For the contract specified them "as indicated

(*Concluded on next page*)

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Avoid Legal Pitfalls

(*Continued from preceding page*)

or required", although only one such joint was indicated on the drawings because the sizes of the monoliths were left to be determined as the work progressed.

Draftsmen, Timekeepers Under Wage and Hour Law

The Problem: Draftsmen and timekeepers were employed by dredging contractors on a project to improve channels used in interstate navigation. Were they covered by provisions of the Federal Fair Labor Standards Act and therefore entitled to time and a half pay for overtime?

Answer of the United States Circuit Court of Appeals, Ninth Circuit: Yes. (Ritch v. Puget Sound Bridge & Dredging Co., 156 Fed. 2d 334.) Said the court:

"They were as much engaged in the construction of the channels inward from Puget Sound, and the retaining walls and dredging installation on the pier to keep open the channel and berths, as were the men dredging the channels and berths, the cement men working on the retaining walls, and the mechanics installing the permanent dredging apparatus on the pier—all pursuant to the draftsmen's plans and the time kept by the timekeepers."

Gov. Spex Imply Warranty Of Gravel-Supply Source

A Federal highway contract specification recited that gravel for crushing was available at certain points near the site. It said that "unless otherwise specifically approved in writing by the engineer, only materials from the above sources shall be used for crushing." But the rock found at the specified places was unsuitable, being soft and tending to adhere to the crushing rolls. Operations were thereby delayed to the contractor's loss.

In the contractor's suit against the Government, the United States Circuit Court of Appeals, Ninth Circuit, upheld judgement for $9,999.99 in his favor. (United States, appellant-defendant, v. Johnson, appellee-plaintiff, 153 Fed. 2d 846.)

The court decided that the specification previously mentioned amounted to a "deceptive representation that rock suitable for crushing was 'available' at a given point, and the contractor was in so many words notified to look there for his source of supply. The inescapable assumption was that the material was adequate as well as suitable. The contractor in estimating costs was entitled to figure his bid on that assumption."

Moreover, it added, "The phrase 'unless otherwise specifically approved in writing by the engineer, only material from the above sources shall be used for crushing' warned the bidder that he was not to look elsewhere in figuring costs of materials; and that if he did so, he ran the risk of having such materials disapproved by the engineer. . . . Requirements of fair dealing underlie Government as well as private contracts."

When It Pays to Be Honest

A Federal statute (28 U. S. C. A. 279) exists to the effect that one who attempts to defraud Uncle Sam in presenting any claim against him shall automatically forfeit all rights under the claim. The Government recently invoked this statute in a case heard before the United States Court of Claims.

As a result, a subcontractor lost the right to recover damages for delay, where his claim was closely related to an extra-work claim which was barred under the statute on account of fraud. (65 Fed. Supp., 794, 800.) The question arose in the course of a suit brought by a general contractor, who was found to have been innocent of any participation in the fraud.

The fraud consisted in the subcontractor's paying $200 to the contractor's manager to secure his "good will", without the contractor's knowledge, and then tacking the $200 onto a bill for work which was chargeable to Uncle Sam.

Extra Pay Claim Denied

The Problem: A contract to construct a dam for a dam authority required quarrying of rock from a quarry designated by the authority. Was a subcontractor entitled to extra pay for removing mud from seams in the rock formation?

The Court's Answer: No, under the circumstances involved. (Jackson Materials Co. v. Grand River Dam Authority, 170 Pac. 2d 552, decided by the Oklahoma Supreme Court.) The court said that there was nothing to show that the Authority or its employees knew, or should have known, of the existence of the mud seams, and that all of the information its engineers had was available to the subcontractor. So far as appeared, neither party knew of the mud seams when the contract was made or when the quarry site was selected.

Computing Dredged Material

A contract for dredging in tidewater channels recited that quantities to be excavated as pay yardages constituted 75 per cent of the estimated quantities, scow measurement, that must be removed from cuts. For experience showed that, owing to the rapid currents, 25 per cent of the material to be removed from the dredged cuts was eroded when disturbed by the process of dredging.

The contract also provided: "The contracting officer will prescribe the overcuts to be made to prevent the encroachment of material from the sides of the dredged cuts. And material actually removed on his order from the prescribed overcuts, whether dredged in original position or after having fallen into the cut, will be estimated and paid for. Material taken from beyond the limits as extended in this paragraph will be deducted from the total amount dredged as excessive over-depth dredging or excessive side-slope dredging and will not be paid for."

Under the foregoing and other provisions of the contract, the United States Court of Claims decided in the case of Great Lakes Dredge & Dock Co. v. United States, 62 Fed. Supp. 675: Deductions were properly made for excessive dredging where the contractor deliberately dredged to the pay limits, whether the excess material was removed by dredging or erosion. The evidence showed that the Government made prompt soundings and sweepings as a means of minimizing deductions for erosion. Failure of the contracting officer to prescribe overcuts did not entitle the contractor to recover for excessive material excavated from side slopes. The provision that overcuts must be prescribed by the contracting officer did not obligate him to make any particular overcut. In any event, a deduction for excessive side-slope excavation would not be precluded in the absence of proof by the contractor as to how much of the deduction was due to the contracting officer's failure to prescribe any overcut.

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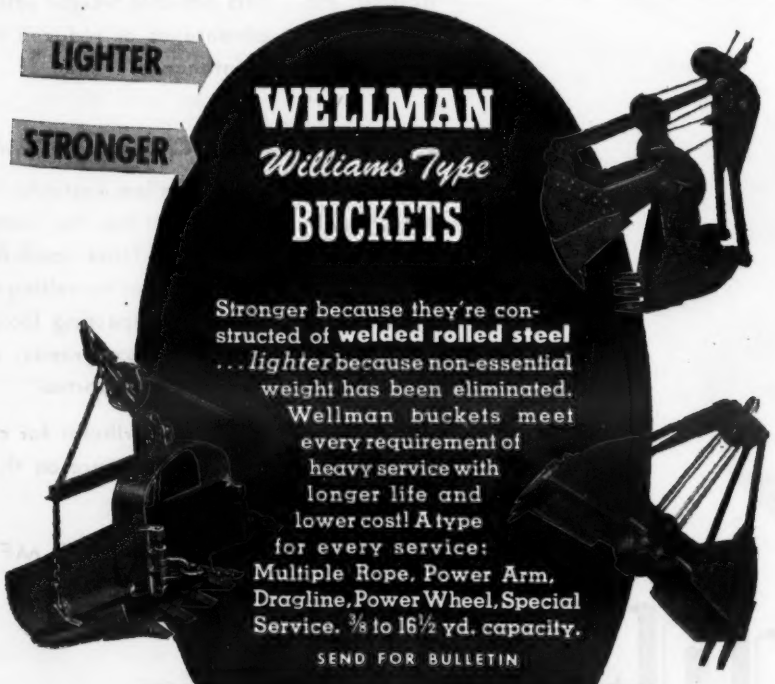

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The Stockland Hydro-Grader blade is shown here in its high position, a foot from the ground. It is operated by the hydraulic lift of the Ford tractor.

A Pull-Type Grader For Wheel Tractors

A one-man multi-purpose pull-type grader for use with Ford tractors is made by the Stockland Road Machinery Co., 2653 34th Ave. So., Minneapolis 6, Minn. It has an 8-foot blade, ⅜ inch thick, with a high-carbon steel cutting edge. Weight of the Stockland Hydro-Grader is 1,200 pounds.

Power is derived from the hydraulic lift of the Ford tractor. The grader has a full range of adjustments including cutting angle, ditch and leveling angles, suction pitch, rear-axle lateral shift, and tractor-hitch adjustment. The blade has a clearance of 12 inches when the hydraulic arms are raised to maximum height. The axle is of 2-inch-square high-carbon steel, and has a mechanical lateral shift with a range of 25 inches.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 6.

Line of Air Tools For Contractor Use

An 80-pound paving breaker for heavy-duty work is made by Schramm, Inc., West Chester, Pa. Air pressure of 70 to 80 pounds and ¾-inch hose are recommended for its use. Bore of the cylinder of the Model B-80 is 2-13/16 inches; stroke is 4 inches; and size of steel is 1⅛ to 1¼ inches. Schramm also makes two other paving breakers: the Model B-35 for horizontal holding in tearing out brick and concrete; and the Model B-60, designed as a lightweight tool easy to handle.

Other pneumatic tools made by Schramm include: rock drills, sheeting-driver attachments for the B-80 paving breaker, a clay digger, trench digger, backfill tamper, tie tamper, line oiler, air gun, pneumatic chain saw, pneumatic circular saw, pneumatic concrete vibrator, and a chain-saw sharpener.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 8.

Laws on Weight and Size Of Trucks and Trailers

A comprehensive free pamphlet on the road laws regulating trucks and trailers throughout the United States has been compiled by the Research Department of The Four Wheel Drive Auto Co., Clintonville, Wis. The 18th edition of "Truck & Trailer Size and Weight Restrictions" is the first since the end of the war; the company says every effort has been made to have the information complete, accurate, and up-to-date.

The laws which regulate the size and weight of trucks and trailers are enacted by each state legislature for operation within its boundaries. Therefore, a knowledge of the laws of all states through which a vehicle will pass while en route is of vital importance to operators and owners.

The Four Wheel Drive Auto Co. secured the cooperation of highway officials who checked and approved the laws of their respective states. However, in several states, limits which were adopted by legislatures, governors, and highway authorities are still in effect on a temporary basis. Changes may be made in the interpretation of the laws by rulings of the courts. Or changes may be made through legislation passed by special or regular sessions of the state legislature. Because such changes may be made, the compilation of the 1947 guide may be subject to corrections in some cases.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 92.

Roller Firm Changes Name

Timco Mfg. Co. has changed its name to Tampo Mfg. Co. A division of the J. E. Ingram Equipment Co., Tampo puts out a line of pneumatic-tire rollers in various models, sheepsfoot tamping rollers, and 3-wheel variable-weight rollers. The firm is located at 1146 W. Laurel St., P. O. Box 2340, San Antonio 6, Texas.

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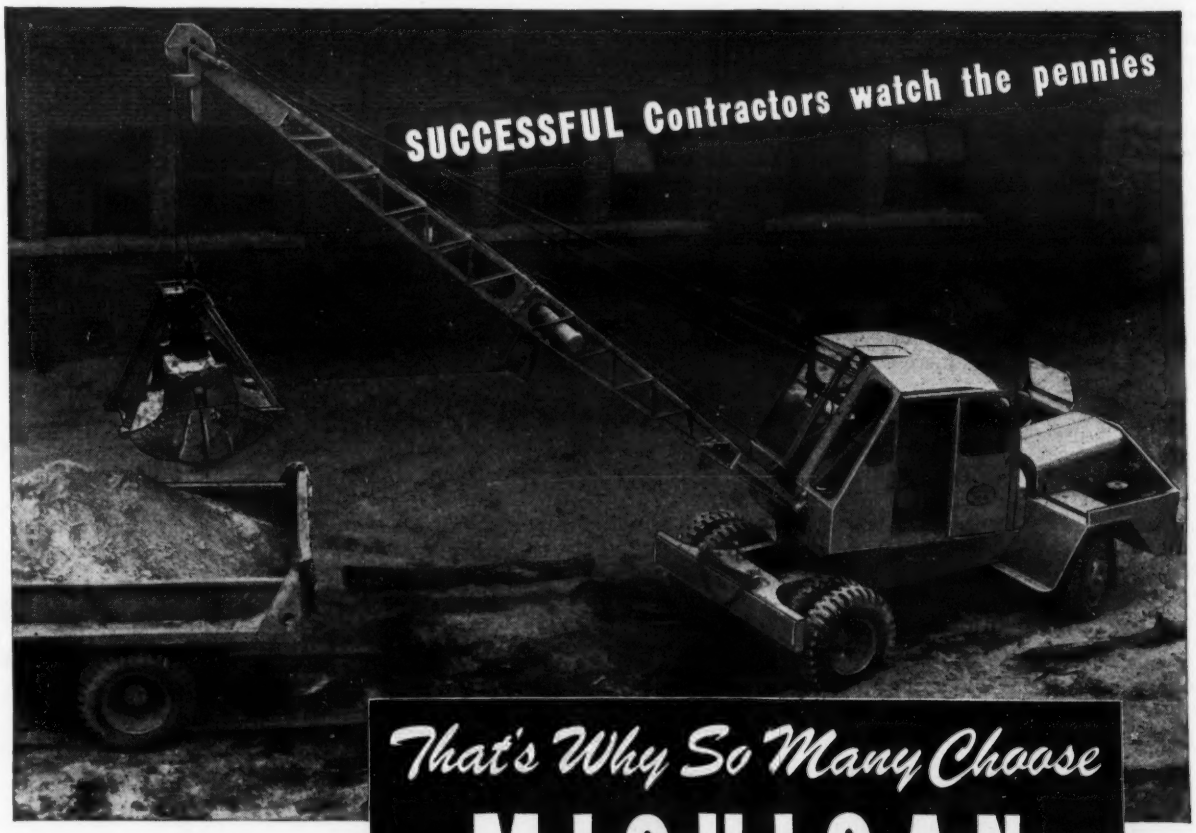

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The Danuser post-hole digger can be installed in a few minutes with adapters to fit most rubber-tired tractors. It digs between 500 and 600 holes a day, says its manufacturer.

Post-Hole Digger

A new post-hole digger for use with rubber-tired tractors has been put on the market by the Danuser Machine Co. of Fulton, Mo. It can be installed by one man in five minutes, the company says, with adapters available to fit most popular makes of tractors. It is designed to dig between 500 and 600 straight holes a day. Augers range in size from 4 to 18 inches in diameter.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 12.

Small Concrete Mixer

A line of concrete mixers is made by the Northwest Tube & Metal Fabricators, 2658 S. E. Tenino St., P. O. Box 2310, Portland 14, Oreg. These mixers are power-driven by Clinton air-cooled gasoline engines having a capacity of 1½ to 2 hp.

The Model NW 13 has a capacity of 3 cubic feet, weighs 280 pounds, and is said to be moved easily by one man. It has either end or side discharge. The Model NWSD 43 has a capacity of 3½ cubic feet, weighs 450 pounds, and is equipped with two pneumatic tires, a retractable tow bar, and a tractor hitch for portability. Its tilting device is gear-operated and is said to lock in any position.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 27.

Sanitary Water Fountain

A timely bulletin on its portable drinking fountain is now available from the Dobbins Mfg. Co., W. Beardsley Ave., Elkhart, Ind. Dobbins fountains are heavily insulated and provide clean, cool drinking water for road gangs and workmen on other types of construction jobs. The manufacturer says that the temperature of the water in them will not rise over 10 degrees in 12 hours, even in the hottest weather.

The catalog shows the construction of the container, the salt-tablet attachment, the adjustable carrying strap, and other accessories. Prices of all attachments are listed.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 85.

Large Selection of Files

A 24-page catalog listing over 3,566 files, rifflers, and countersinks has just been made available by the Grobet File Co. of America, Inc., 421 Canal St., New York 13, N. Y. A large number of these Swiss hand files are illustrated in the catalog to simplify the process of selecting the style, pattern, size, and cut needed.

In addition to these standard files, numerous special files bring the Grobet line up to more than 5,000 different patterns, sizes, and cuts.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 88.

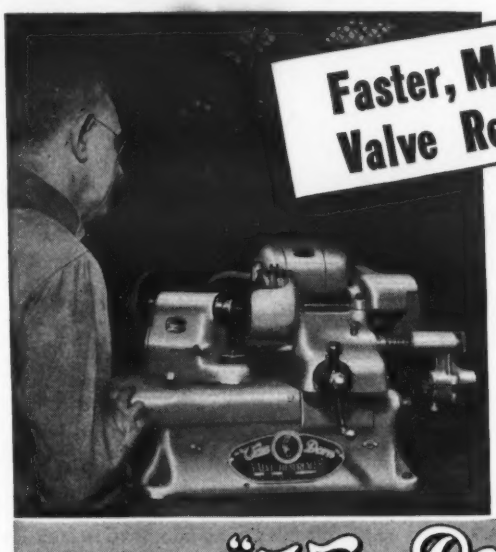
New Engine Features Ease of Maintenance

A new addition has been made to its lightweight-engine line by the Scott Engine Co., 1 No. LaSalle St., Chicago 1, Ill. It is a 2-hp unit with a patented head which embodies the valve mechanism and combustion chamber. It is claimed that this replaceable head will permit fast repair or replacement with a minimum of shop equipment.

An integrally cast crankcase housing and cylinder block of aluminum are weight-saving features. The engine is a 4-cycle valve-in-head unit. The 2¼-inch flat-headed aluminum piston has a 2¼-inch stroke.

Other features claimed for ease of maintenance are replaceable valve guides, a replaceable cast-iron cylinder liner, and a greatly simplified arrangement for valve adjustment. All accessory parts such as the carburetor, filters, etc., are standard.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 16.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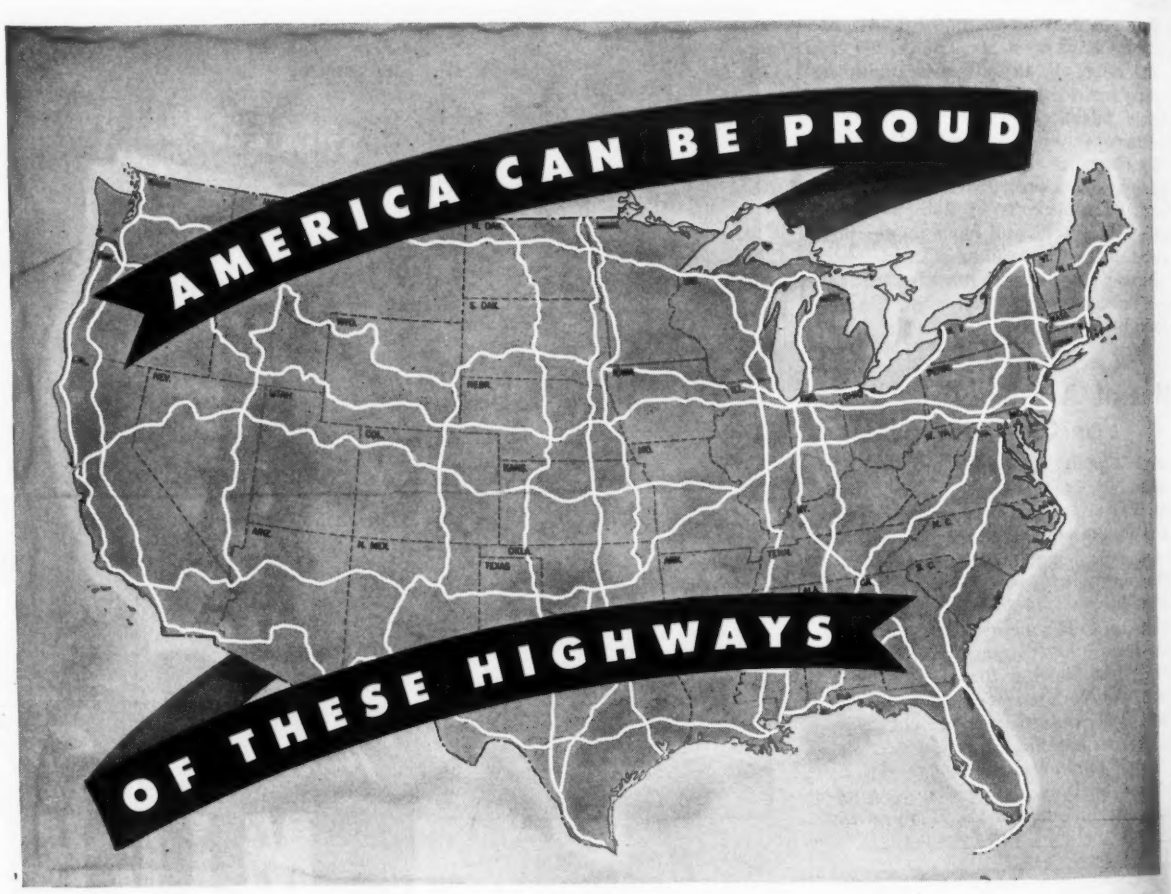

Shown on the map above are a few of the principal highways of the great U. S. highway network, now 31 years old and begun with passage by Congress of the Federal-Aid Road Act in 1916. And it's just 21 years since U. S. highways have been uniformly marked, with north-south routes given odd numbers from 1 to 101, and east-west routes even numbers from 2 to 90. U. S. feeder routes have higher numbers with final digits referring to the main roads they serve.

There's a lot of history and romance in our highways, many of them following old wagon trails of pioneer days. What tourist, planning a long motor trip, hasn't thrilled to vistas opened up by U. S. 1 . . . U. S. 11 . . . U. S. 41 . . . U. S. 2 . . . U. S. 30 . . . U. S. 40 . . . ribboning away for hundreds of miles, up and down and across the land? And what businessman or salesman, traveling long distances by automobile, hasn't been conscious of the benefits afforded by Federal highways?

By supplying contractors with the steel products needed for modern concrete roads and for bridges of all types, Bethlehem has had a part in the building of many of the important links in our national highway system. Today, with so many highways to be repaired or relocated, and new bridges built, Bethlehem again offers well-rounded service and a line of road steels designed and built for top-notch performance. If you have a highway job coming up in the near future, we suggest you get in touch with the nearest Bethlehem district office.

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BETHLEHEM STEEL

STEEL FOR HIGHWAYS

Power Development Under Way on River

New Hydro Plant With Two Concrete Dams, Powerhouse, And Canal Is Being Built On Old Paper-Mill Site

(Photos on pages 44 and 45)

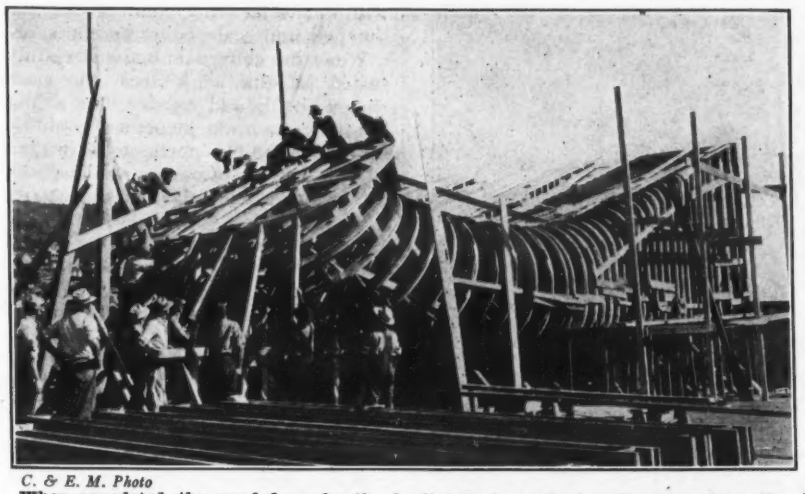
✦ AT a spot far up in the White Mountains of northern New Hampshire, the Androscoggin River drops 87 feet in a series of falls and rapids. There the Public Service Co. of New Hampshire is developing a natural head of water for use as electrical energy.

The project is located in Berlin on the site of an abandoned plant formerly owned by the International Paper Co. Several red-brick buildings, including the old powerhouse with massive 5-foot masonry walls, were razed to make way for the new development which is spread out for half a mile along the river.

At the north end of the project a concrete gravity-type dam has replaced the former timber-crib structure that checked the flow of the river. From behind this dam at a pool elevation of 1,009, the water will enter a canal, 500 feet long x 100 feet wide x 20 feet deep, made by constructing concrete walls up to 30 feet in height.

From the canal the water will enter an 18-foot-diameter steel penstock, 1,500 feet long, which has a 70-foot-diameter steel surge tank, 50 feet high, located 200 feet back from the outlet. The penstock will conduct the water through a deep cut at its lower end into the new powerhouse where it will drive an 18,750-kva generator. From the powerhouse the water will be discharged through a draft tube into the tailrace at elevation 922.

Another concrete dam, an arch-type structure, is constructed across the old channel near the south end of the project. It will contain any possible flood, and prevent it from sweeping down through the canal and over the penstock into the powerhouse. But ordinarily this old channel will be dry, and any high or flood waters that the penstock cannot carry will be diverted through a waste-water channel on the opposite side of an island east of the canal. Water enters this waste channel through sluices and over the upper dam, and also by an outlet from the canal.



C. & E. M. Photo

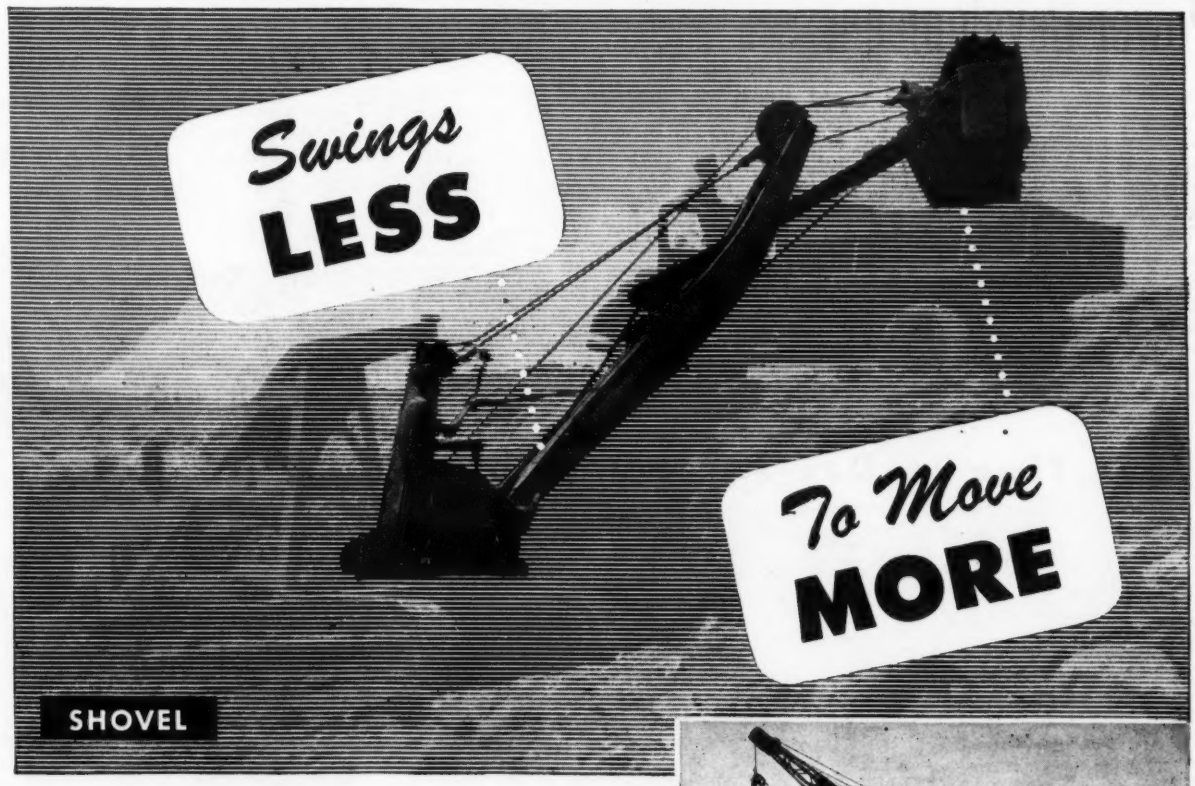
When completed, the wood form for the draft tube to conduct water away from the N. H. Public Service Co. powerhouse to the tailrace resembled a ship's funnel. The ribs were made from 2 x 10's curved to fit the 27 various-shaped sections.

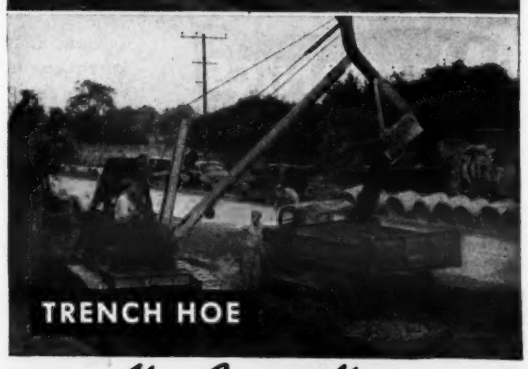
The project was constructed by the Sanders Engineering Co., Inc., of Portland, Maine, with the engineering design and supervision supplied by Nepsco Services, Inc., Augusta, Maine. Work started in April, 1946, and power is scheduled to be on the line by next autumn. This project is part of a master plan for developing additional water power for electrical energy on the Androscoggin River. And from three to five other sites will be developed later but on a smaller scale.

Upper Dam

Before the concrete gravity-type dam could be built at the upper end of the job site to replace the old wooden-crib structure, a cofferdam first had to be constructed across that part of the river about 100 feet upstream. The new dam goes only part way across the river from the western bank to tie into a rocky island. From this point another dam, which is to remain, connects with the east bank. A crib cofferdam was built of Norway pine and hemlock logs. It

(Continued on next page)





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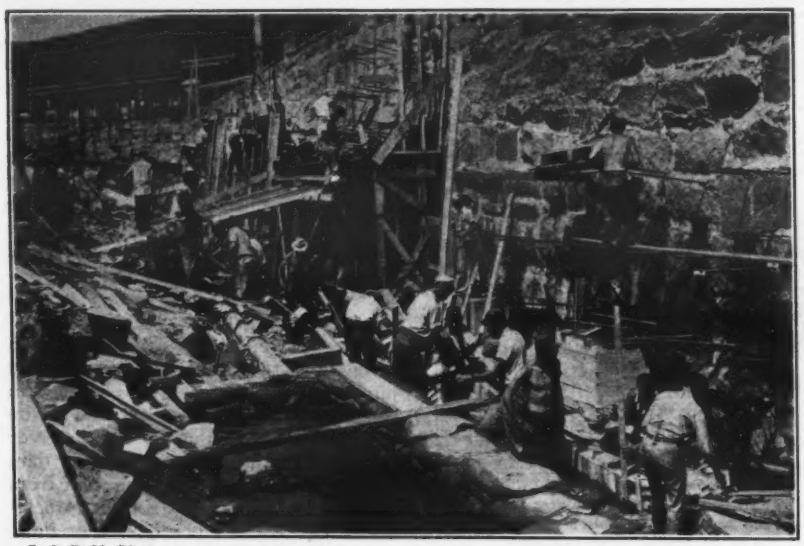

C. & E. M. Photo

In building the power canal for the Androscoggin hydroelectric plant, Sanders Engineering Co. used the west wall of the old waterway as a form on one side against which to erect the new concrete wall. The old wall was underpinned with concrete blocks on 15-foot centers. In the foreground, men pause for a drink of water.

Power Development

(Continued from preceding page)

was filled with rock and chinked with fines, and sunk to the bottom of the river, which is of varying depth according to the contour of the ledge rock.

The logs were from 8 to 15 inches in diameter and from 16 to 40 feet long. They were assembled in sections from 30 to 70 feet long composed of 8-foot checks or squares. The logs were framed to each other and connected by ¾-inch 18-inch drift pins. These were driven into 11/16-inch holes made with a Chicago Pneumatic Power Vane wood auger powered by an Ingersoll-Rand 210-cfm air compressor. The cofferdam varied in width from 16 to 24 feet in proportion to the 8 to 22-foot depth. As tier after tier of logs was added, the structure slowly sank until it rested on the bottom of the river. It was then filled with material excavated from other parts of the site.

To seal the cofferdam further, 16-inch steel sheeting, 29 feet long, was driven along the upstream face and toe-filled with fine material. A McKiernan-Terry No. 7 air hammer, suspended from the 50-foot boom of a Koehring 304 crane, drove the sheeting. The rig also worked along the top of the cofferdam filling it with material that the trucks had dumped into scale boxes on the shore.

When the cofferdam had successfully sealed off the work area, the crane ripped out the old wooden dam so that the new concrete structure could be built about 50 feet north of the original site. A battery of pumps was available with which to keep the area unwatered; it included one 8, one 4, two 2-inch Jaegers, two 6-inch Gorman-Rupps, and two 2-inch Ingersoll-Rand sump pumps. The gravity-type dam was then built to a length of 360 feet, and with a maximum height of 20 feet depending on the profile of the ledge foundation. It is equipped with gates for controlling the flow of the water.

Excavation

While this work was proceeding, most of the old buildings which formerly made up the big paper-making plant, and numerous walls, were being razed to make room for the new canal and penstock. This demolition was speeded considerably by using a Northwest crane with a 60-foot boom to swing a 2,600-pound steel ball against the sides of the mills and walls, toppling them to the ground. Where the structures were too thick for this pounding, they were drilled with jackhammers and then blasted. Considerable rock was encountered in digging the channel for the new canal and in excavating for the penstock and powerhouse.

On the rock work the contractor had available for use four Ingersoll-Rand wagon drills, and both Ingersoll-Rand and Chicago Pneumatic small tools, in-

(Continued on next page)

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BUT WE'RE COMING DOWN!
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TARPAULINS JUNE 1947

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7 x 9'	4.62	7.84	32c
7 x 12'	6.16	10.53	32c
8 x 15'	8.70	14.74	38c
9 x 12'	7.94	13.20	45c
10 x 12'	8.80	14.74	38c
10 x 15'	11.00	18.04	45c
10 x 21'	15.40	25.27	54c
12 x 16'	14.08	23.11	38c
12 x 20'	17.60	28.84	49c
14 x 15'	15.40	25.27	48c
15 x 20'	22.00	36.07	54c
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No.	O.D. Exhaust	Price
1	2⅛"	$1.90
2	2⅜"	1.90
3	2¾"	1.90
5	1⅞"	1.90
55	2"	1.90
6	1½"	1.90
7	2½"	1.90
8	3"	2.50
9	3⅛"	2.50
10	3¼"	2.50
11	3½"	2.75
12	4"	3.00

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C. & E. M. Photo

To topple old mill buildings and make way for the new canal and penstock on the Androscoggin, this Northwest crane with a 60-foot boom swung a 2,600-pound steel ball against their walls. Here it is demolishing the old powerhouse of 5-foot-thick masonry.

Power Development

(Continued from preceding page)

cluding twelve jackhammers and six paving breakers. Power for this equipment was supplied by eight 315-cfm air compressors, six Chicago Pneumatic and two Ingersoll-Rand. With the wagon drills 1¼-inch drill steel was used, starting with 6-foot lengths and increasing by 2-foot increments to 18 feet. Bits were from 2½ down to 1¾-inch size. The smaller tools used 1-inch steel.

The rock was taken out in single lifts up to 16 feet, except at the powerhouse site where two such lifts were necessary. At the penstock cut, the rock was from 3 to 16 feet deep and 24 feet wide and was mostly granite. Atlas 60 per cent dynamite was used in the blasting, and as many as four cases distributed over 40 holes were shot at a time. As a safety precaution, steel mats were placed over every charge to keep the rock from flying around. Furthermore only 500 pounds of dynamite at the most was kept on the job; this was stored in a remotely located wooden shack which was practically covered with sand.

The powerhouse site was down in the gorge at water level. Most of the rock cut was removed from it by loading trucks with power shovels. However, an American 20-ton derrick with a 115-foot mast and a 100-foot boom was set up high above the excavation on the west bank of the Androscoggin. The derrick was held in position by seven guys. It was equipped with a Thomas elevator 4-drum direct-swing hoist operated by a 125-hp electric motor. And it was mounted on a bull wheel so that it could swing in a full circle. Large chunks of rock were loaded by hand into a couple of 2-yard scale pans that were then hoisted to the top of the gorge. The derrick will also be used in handling the heavy equipment that will go into the powerhouse.

Material, both rock and dirt, was excavated from the different locations by two 1½-yard shovels, a Northwest and a Bucyrus-Erie, and loaded into five Sterling 6-yard trucks. Two International TD-14 tractor-dozers cleaned up around the shovels and leveled off the sites. The material did not have to be hauled from the project as there was plenty of room to waste it near-by.

Some of it was needed at a substation site on the opposite side of the river, and direct access was required in order to carry on operations on the other side of the rocky gorge. Accordingly a work bridge was thrown across the old channel directly below the new lower dam. The bridge was constructed of wooden trestles supporting eight 15-inch I-beams as stringers; across these a deck of 3 x 6's was laid, making the bridge 14 feet wide. The structural members were taken from some of the old mill buildings that were razed.

Power Canal

The old paper-mill layout had a power system with a canal constructed of masonry walls. In building the new canal the contractor used the west wall of the old waterway as a form against which to erect the new concrete wall. The east wall of the old canal did not rest on ledge rock and so it was removed. The foundation of the old west wall was strengthened by underpinning with concrete blocks 3 feet square and from 3 to 5 feet deep on 15-foot centers. Holes were drilled and dowels were grouted into the masonry walls to bond the concrete to the stone.

The new west wall is 7 to 8 feet wide at the bottom with a 5-foot width on top. It is 6 feet higher than the old masonry wall. The batter on the exposed face is 1½ inches to the foot. The east wall is a gravity-type section with a height of 25 to 30 feet, the same as the opposite wall. It is 10 to 15 feet wide at the bottom, with a batter of 6 inches to the foot on the back and 1½ inches to the foot on the face; it has a top width of 2½ feet. A layer of rock was placed as backfill to a height of from 5 to 10 feet, where the base of the walls was below canal bottom.

Wall forms were made from 1-inch stock backed by 2 x 6 studs on 16-inch centers with a single 3 x 6 wale on an average of 2-foot centers. Further reinforcing consisted of a vertical 3 x 6 strongback every 3 feet. Richmond form ties were used throughout. Where the top of the west wall projected above the old masonry, Atlas steel planks in 8 and 10-inch widths were used for forms. These came in 12-foot lengths and were locked together by wedge bolts. Placed horizontally, they were braced vertically with 3 x 6 strongbacks on 3-foot centers. Sandbag cofferdams

(Continued on next page)

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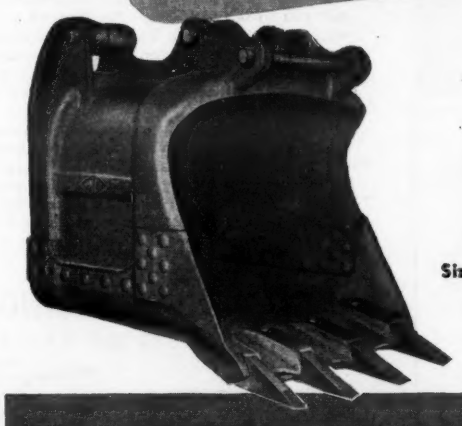

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Power Development

(*Continued from preceding page*)

were placed around the bottom of the forms and pumps kept them dry while the lower lift was being poured.

Concreting Operations

A central batch plant was set up near the power canal. It consisted of a Warren Brothers 3-compartment bin of 125-ton capacity alongside of which was a large frame structure where the concrete was centrally mixed. The aggregate bins were loaded by trucks backing up a dirt ramp, and end-dumping directly into the hoppers. The center compartment for storing the large-size gravel was about twice the size of the two outer compartments where the pea gravel and sand were kept. No stockpiling was done nor a crane required, since the source of aggregate was only 6 miles away at the pits of the New Hampshire Sand & Gravel Co. near Gorham, and trucks delivered the material as it was needed.

To screen out cobbles, etc., a 3-inch square sieve made of ¼-inch reinforcing steel was placed across the bin outlet. Coarser-meshed grizzlies were also installed at the top of the bin. The aggregate was weighed out in an Erie batcher on a Buffalo beam scale.

The adjoining building where the concrete was mixed was a wooden structure covered with tar paper. It had a 50-foot front and 50-foot depth in the central section. The inside vertical clearance was sufficient to accommodate the raised skip on a big paver. Dragon bag cement was stored in the wing adjacent to the aggregate bin; it was purchased from the Lawrence Portland Cement Co. plant at Thomaston, Maine, and shipped by rail to a siding of the B & M Railroad only ¼ mile from the job site. There it was loaded into trucks with steel roller conveyors, and hauled to the plant where the conveyors were again used in unloading and stacking the bags in piles. The cement was moved along to the paver skip on these same conveyors.

When the contractor was pouring the arch dam and the powerhouse structures at the south end of the project, the concrete was mixed at the site. So the bags of cement were chuted down from the side of the storage house into the batch trucks. But for the other work at the north end of the job, including the gravity dam and canal walls, concrete was mixed at the central plant.

For that set-up, the aggregate was dumped into two Chevrolet trucks carrying two batches each, which backed down a ramp under the bins and picked up their loads. They then backed into the plant building and discharged their contents into the skip of a MultiFoote 27-E single-drum paver. The building was designed to accommodate another similar paver which was on the job. But this was used chiefly for on-the-site mixing for the structures at the lower end of the project.

When the concrete was mixed at the central plant, it was discharged down a chute into the hopper of a Rex Model 180 Pumpcrete set up beneath the building. Two gas engines operated the machine, a Le Roi turning the vanes on the hopper and a Waukesha driving the pump which forced the concrete through a 7-inch line. Two pipes left the bottom of the hopper to form a Y connection into a 4-foot section.

This section was lifted out by a Yale 2-ton hoist when the line was cleaned at the end of the day's pour. Cleaning was accomplished by putting a burlap bag in the pipe line followed by a well greased double washer known as a "go-devil", and forcing this through the line with a stream of water pressure. Water for the concrete mix and cleaning the pipe line was tapped off the Berlin water mains and brought to the plant in a 3-inch line.

To reach the forms at the upper end of the job 1,000 feet of line was available. And the concrete filling the 3-yard hopper on the Pumpcrete was pushed out at the rate of 30 to 35 cubic yards per hour. The pipe line was raised to the height of the canal walls on a trestle and the concrete was discharged into the forms through a hopper and elephant-trunk pipe. The walls were built up in three lifts averaging 10 feet each.

The mix for the different pours varied between 5 and 6 bags of cement to the cubic yard. A typical 5-bag batch had the following dry weights:

Cement	470 lbs.
Sand	1,230 lbs.
Gravel (½ to 2-inch)	2,020 lbs.

To this was added 30 gallons of water, and Darex AEA at the rate of 30 to 35 cubic centimeters per bag of cement. The admixture permitted lighter batch weights of both aggregates and resulted in an average of 4 per cent air entrainment. A 2-inch-slump concrete with about 3,500-pound strength was used in the pipe line.

Arch Dam

In building the concrete arch dam, the contractor used a stronger mix which required 5¾ bags of cement to the cubic yard. This structure is 100 feet long on top, 4½ feet wide at the bottom, and 3 feet wide on top. The radius of the arch is 50 feet and its height above the riverbed is 40 feet. The upstream face is vertical.

The wall forms were built in panels 9½ feet long and from 7½ to 10 feet high. They consisted of ⅞-inch boards set vertically and backed by curved ribs made from 2 x 6's set on 15-inch centers. These were supported by double 3 x 6 vertical strongbacks on 30-inch centers. Richmond form ties on 30-inch centers both ways held the forms together.

To pour the arch dam a trestle was erected above and slightly off the center line of the forms; it carried a 36-inch-gage track on which a side-dump hopper car could operate. The concrete

(*Concluded on next page*)

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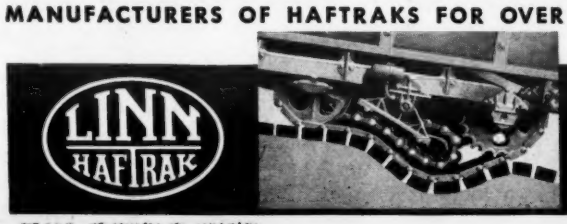
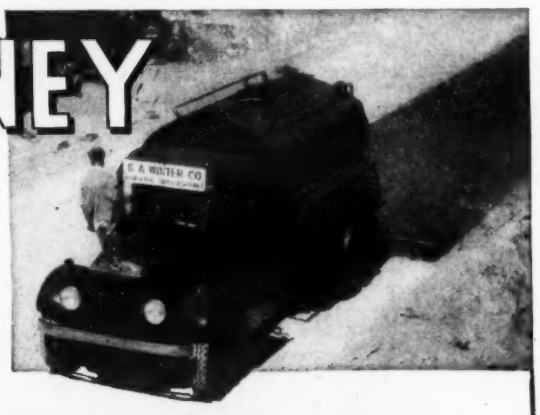


KINNEY

BITUMINOUS DISTRIBUTORS



FAST ROAD SPEEDS • UNIFORM APPLICATION

Fast and accurate, the KINNEY Distributor handles all grades of bitumen used in road work — tar, asphalt, road oil, cut-back and emulsions — up to 400 g.p.m. It is equipped with the famous KINNEY SD Rotating Plunger Pump, accurate as a meter, and applies material fast in the precise amounts specified by the highway engineers. Throughout the world KINNEY Distributors have a long-established reputation for speed, reliability and accuracy.

Write for Bulletin

KINNEY MANUFACTURING COMPANY
3531 WASHINGTON STREET, BOSTON 30, MASS.
New York • Chicago • Philadelphia • Los Angeles • San Francisco
We also manufacture Vacuum Pumps, Liquid Pumps and Clutches

Power Development

(*Continued from preceding page*)

was mixed in a paver set up on the bank of the gorge with the batches hauled down from the central plant. The concrete was then discharged into the cars which were pushed out over the trestle and dumped into the forms.

At the powerhouse the concrete was mixed in the paver and emptied into a Blaw-Knox 1-yard concrete bucket which was swung over the forms by a 20-ton guy derrick.

Contractor's Shops

A place holding great importance in the progress of the work was the carpenter shop, a 32 x 40-foot wood building. There over 400,000 feet of lumber was planed from rough cuts on a 4-sided planer. Other equipment included an 18-inch-diameter swing saw; a DeWalt 16-inch circular bench saw; a 12-inch buzz planer; and a 36-inch band saw. Outside the shop 1¾-inch stock was bolted together to make forms 10 x 10 inches x 18 feet long for the construction of concrete crib sections.

Of greatest interest, however, was the construction of the wood form for the draft tube which will conduct the water away from the powerhouse to the tailrace. This was built on a 50 x 60-foot work platform on one side of the shop. When completed the tube form looked something like a ship's funnel. It had a circular opening at the top or inlet end with a diameter of 12 feet. From this end to where the tube makes a 90-degree bend is 17 feet, and then the form continued for 37 feet to the outlet.

At every point along the tube the cross section changes constantly until at the outlet end the shape is a 31 x 11-foot rectangle. Two concrete piers 3 feet wide will extend back from this end 15 feet into the tube, changing the outlet into three smaller rectangles, each 8 x 11 feet.

The various-shaped ribs were made from 2 x 10's curved to fit the 27 various-shaped sections. They were connected to each other with 3 x 6's at different intervals to fit the curve of the tube. When completed, the draft-tube form was cut up into 5 pieces which were brought to the powerhouse site and reassembled. The tube form was set up within the surrounding ledge rock which served as an outside form. Concrete was then poured in the 2 to 3-foot space between the outside of the form and the rock. On the straight sections the ribs were covered with 1⅛-inch boards, but on the curved portions two layers of 9/16-inch lagging were used.

Reinforcing steel for the various structures was supplied by Bancroft & Martin Rolling Mills Co. of South Portland, Maine, and delivered to the steel yard at the site by truck. Rods were shaped on a bender, and cut on an Edwards No. 20 shear machine.

One of the old mill buildings that did not have to be removed for the new construction was converted into a blacksmith shop. It was equipped with a 3 x 4-foot forge and a Buffalo blower, a 250-pound anvil, a Cincinnati bench grinder, and an oxyacetylene welding set. Much of the welding was done with a Lincoln 300-amp portable electric welder.

Another small 25 x 50-foot building still standing was used as a stock room and shop. It contained a workbench with bench vises, a SkilGrinder, a Millers Falls bench drill, and an Oster-Williams pipe-threading machine. Shell diesel fuel and gasoline together with Shell and Texaco oils and greases were dispensed here. To the force of 325 men at work on the project, drinking water was distributed in covered containers and poured into Dixie, Vortex, or Lily paper cups.

Quantities and Personnel

The major items involved in this power-development project included the following:

Earth excavation	50,000 cu. yds.
Rock excavation	34,000 cu. yds.
Concrete	23,000 cu. yds.
Reinforcing steel	250 tons

The steel penstock and surge tank will be installed by the Chicago Bridge & Iron Co., while the Baldwin Locomotive Works will furnish and set up the 18,000-hp water wheel. The single-unit generator will be a G-E machine. A 28-mile 110-kva transmission line will be erected by the Hoosier Engineering Co. of Columbus, Ohio.

N. D. McKenney was Superintendent for the Sanders Engineering Co., Inc. J. B. Downey was Engineer for the Nepsco Services, Inc., assisted by Capt. Karl B. Whitcomb and Col. E. J. Surowiec. G. E. Hunter, Jr., is Manager of the northern division of the Public Service Co. of New Hampshire, with headquarters at Berlin.

Absorbs Brow Sweat

A gadget for reducing the discomfort and hazard of brow sweat in these hot summer days is produced by the Standard Safety Equipment Co., 232 W. Ontario St., Chicago 10, Ill. StaSafe Koolpads are made of soft reinforced cellulose sponge to absorb all brow perspiration. The pad is held in place by an elastic band which is adjustable to head size. Other models are made which will clip to a welder's helmet or hard hat.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 99.

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CONVEYOR, ELEVATOR and TRANSMISSION BELTING all widths and plies

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AIR · DISCHARGE · STEAM
FUEL · COMPRESSOR · VACUUM
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BOOTS, DREDGE SLEEVES, PUMP DIAPHRAGMS, ETC.

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A Word to the Wise . . .

ORDER YOUR WALTER SNOW FIGHTERS Now!

WINTER may seem a long way off on the calendar—but if you want additional snow removal equipment next winter, better take action NOW!

Our shops are busy producing Walter Snow Fighters and Tractor Trucks. However, with demand running high, plus uncertainties in production, we'd like to schedule your needs now and make every effort to deliver on time.

We suggest that you get in touch with your nearest Walter distributor. He will be glad to give you full details on the many features of Walter Snow Fighters and help you select the correct model and equipment for your needs. If you wish, write us direct for detailed literature.

Advantages of WALTER SNOW FIGHTERS

- No slipping, stalling or wheel-spinning, because the exclusive 4-Point Positive Drive delivers power to each of four driving wheels according to its traction at any instant.
- Clear 28 foot widths in one run; clear at speeds up to 30 mph.; throw snow far to the side, making widening out easier; buck through deepest drifts.
- Models from 125 to 350 hp., available with correctly designed offset V-plows, one-way plows, speed plows, center scrapers, sand and chemical spreaders according to needs.

WALTER MOTOR TRUCK CO. 1001-19 Irving Ave., Ridgewood 27, Queens, L. I., N. Y.

WALTER SNOW FIGHTERS

Radar May Radically Alter Coast Surveying

(*Continued from page 2*)

Unlike the Army master mind wearing a first lieutenant's bars at Pearl Harbor, who told technicians to "forget it" when they reported Jap planes, Vance has challenged the attention of all his crew of technicians by demanding closer accuracy than the boys ever used when tracking targets during the war.

Azimuth and range are read from dials at definite intervals when the fix button on the fathometer is pressed. These readings are given over FM radio to the plotting room aboard the Galvez, where they are plotted on previously prepared charts of the area, made to a scale of 1 to 10,000.

Power for the land station is furnished by a portable M-7 generator set, and led in through rubber-covered cables.

There were a number of reasons for selecting the SCR-584B type of land radar, even though a heavier-duty set called the AN/MPG-1 has been developed. The latter set is 8,000 pounds heavier, and its antenna has to be erected on a tower before it can operate. A great number of SCR-584B sets were manufactured and used during the war, and are now either stored or gathering rust. A large number of technicians now discharged from the Army know the SCR from top to bottom, and can be depended upon to operate the sets and to maintain them in good working condition.

In first getting hold of the set, Vance proved himself a master at the art of cumshaw. Cumshaw as practiced on large scale by Marines and Seabees during the war consisted of trading a case of beer for a jeep, or a chocolate bar for the favors of some comely Chamorro miss. Vance traded nothing and wound up with $200,000 worth of radar gear. He can quote a thing in this connection called Statutory Authority 10 U.S.C. 1257 and 1311, but it detracts not one bit from the imagination and persuasive qualities of this engineer.

He started out at first with a sort of country-club acquaintance with a communications officer based at Galveston. The communications officer agreed that the idea might work, and put Vance on the track of an SCR-584B and its crew, alerted to move from Galveston. Vance succeeded in borrowing the unit and its crew for a ten-day test.

Preliminary tests showed such possibilities that an appeal was made to the communications section of the War Department for the outright transfer of the needed gear. With fine cooperative feeling for a sister department, the communications branch sent Set No. 8 to the Galveston Office. This set had gone through the Italian campaigns, and been operated well beyond the overhaul limits for equipment of its type. It was new in 1943.

Having an old unit, however, called forth the best talent in the crew of technicians, and they have accepted the challenge in good grace. These boys are not so bad at cumshaw themselves. You would never realize how many odd sizes of radar and radio tubes are floating around Galveston, Texas, free for the asking! The very rumor that a few of these parts come from the same communications department which furnished the land radar set is a secret in itself.

One of the civilian technicians now operating the land radar station was a corporal on that first crew who made the ten-day experimental test.

Survey Personnel

Two survey engineers operate the land station, furnish hourly tide data, and give positioning data by FM radio to the Galvez. These men also drive the mobile unit to a new site, set up equipment, adjust, repair, and maintain the radar station, generator set, radio equipment, and so on. They also set the tide gage before surveys begin. They sleep and eat aboard the Galvez.

Two survey engineers aboard the Galvez operate the FM radio and fathometer, direct the course of the Galvez during survey runs, and plot the position data as furnished by the radar station. Areas covered in this way are easily seen, and the master of the survey boat can be directed to cover the additional areas required. These two men also adjust, repair, and maintain all survey equipment aboard the Galvez.

The boat crew is composed of the master, chief engineer, deckhand, and cook. Capt. C. P. Eidelbach is Captain of the Galvez, and W. W. Rimes is her Chief Engineer.

Accuracy of Results

The accuracy of radar positioning, which has exceeded original estimates, can nonetheless stand some improvement. On one range the radar readings gave ranges too long in 21 cases, too short in 13 cases, and on the nose for accuracy in 4 cases. At first the radar showed a tendency to give readings too long. A slight technical adjustment changed the readings the other way. The average error in positioning was about 25 yards either way on a one-mile "shot", but azimuths were amazingly close. The azimuth scale of 360 degrees on the PPI scope of the radar set is divided into 6,400 mils, or about 17 mils per degree of azimuth. The set showed many readings for azimuth accurately, with the average lead or lag error about 3 mils.

It was noticed that on the constant-azimuth course, where the range was changing rapidly, the best results were obtained. On the constant-range course where the azimuth was changing rapidly, results in azimuth were extremely accurate. The SCR-584B was developed for tracking planes and other fast-moving targets, and it is believed that better results will be obtained with a radar set more sensitive to slow-moving targets.

However, the new SCR sets not subject to errors due to overage and wear are designed to give accuracies to one mil in azimuth, and 5 yards in range within the reaching limit of the set. Efforts are now being made to recondition the land set, and bring it up to this standard of accuracy. As the system now stands, the radar method is good for the preparation of hydrographic charts which go to the Hydrographic Office.

The time is definitely not far off, Vance believes, when radar and the fathometer will be used to make preliminary and even final estimates for before and after dredging quantities, breakwater and jetty surveys, and so on.

(*Concluded on next page*)

Concrete Form Construction At *HALF* The Cost

YOU CAN NOW offset today's labor costs with the Atlas Steel system of form construction. STEEL forms are designed for the specific job and standardized for continual re-use. Savings are amazing both in labor and materials.

Take these complicated bridge piers, for example. The entire job was completed with labor economy and substantial overall savings with one set of Atlas Steel Forms.

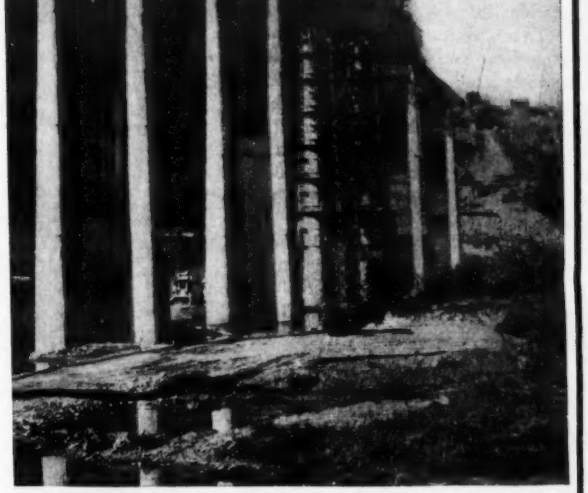
Take advantage of this new labor-saving process. Call on us for layouts, job studies, cost comparisons and Atlas Labor-saving Steel Forms.

Concrete Forms Corporation

Formerly Forms Division, Atlas Steel Construction Co.

50 John St. **Irvington, N. Y.**

Write Dept. E, New York City Sales Office, 43 Cedar St. Tel. BOwling Green 9-4030



Piers for the Youghiogheny River Bridge. Cayuga Construction Co., General Contractors. Piers are 128' high, 11' dia. at base, 5' dia. at top. Arch is supported by centering, cross wall is 60' high. Steel forms, which are easy to set, strip and move, gave true contour and smooth finish.

Atlas *Labor-Saving* Concrete Forms for every Purpose

DUPLEX TRUCKS for Heavy-Duty Service

- Built to travel with tough company.
- Trucks designed especially for road maintenance and construction.
- Heavy duty trucks for 40 years.
- Send for specifications.
- Limited territory available.

DUPLEX TRUCK COMPANY

LANSING 4, MICHIGAN

Radar May Radically Alter Coast Surveying

(Continued from preceding page)

A sum of $385,000 was spent at Galveston during 1945 on hydrographic soundings. This fact, plus the great possibility of increased efficiency in locating soundings, seems to indicate that any money spent to further the development of these procedures will mean an eventual saving of considerable money to the U. S. Engineers and other governmental agencies as a whole. And that means to the people who pay taxes, in the final analysis.

What penicillin did for doctors, radar may now do in the most dramatic fashion for hydrographic engineering. The old days when surveyors slogged through the mud of swamps and battled waves in a leaky old boat may now give way to a new era of science and technical advancement.

As Vance explains it, "It's considerably easier to teach a radar technician the fundamentals of hydrographic surveying than it is to teach a surveyor all there is to know about radar."

The day that the Western Editor of CONTRACTORS AND ENGINEERS MONTHLY went out to see this experiment, Captain Eidelbach had just finished making a 50-mile profile of the center of the Houston ship channel in about 5½ hours! He was running on established center-line markers, of course, and using only the fathometer to shoot the depths.

Personnel

A great deal of credit for the work must be given to the man who encouraged the research and gave it his support and advice whenever possible, Colonel D. W. Griffiths, USA, who was the District Engineer at Galveston during all the period of research. Vance, formerly Operations Officer, is now the civilian head of the Operations Division. E. H. Vaughn, Jr., and a host of other District employees who gave the new idea a fair test all deserve mention for their part in an experiment which bids fair to command world-wide engineering attention in a few years, or even sooner.

Protective Coatings

Coatings designed to protect wood, metal, concrete, or brick from destruction by weathering, atmospheric corrosion, mildew, and termites are among the products of Carbozite Protective Coatings, Inc., 611 So. Main St., Greensburg, Pa. These include Carbo Standard White N and T, and Barriercoat.

White N, a semi-glossy white, is resistant to weathering and to mild acids and alkalies in the atmosphere. White T is designed to combat and nullify the danger of mildewing caused by the growth of fungi and algae, and to prevent destruction by termites. Both coatings may be applied by either brushing or spraying. Drying time is 4 to 6 hours. White is the color manufactured at present, but other colors for special needs may be made available.

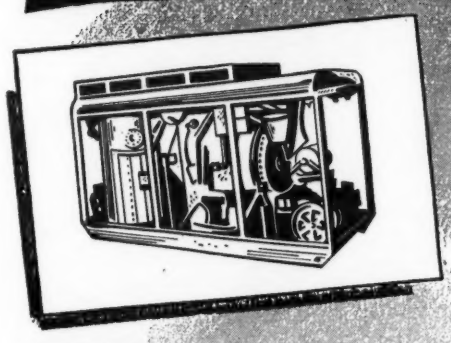
Barriercoat is designed to moisture-proof surfaces. It is compounded from 100 per cent species of bituminous base gum. Petroleum solvents are used as a carrying vehicle so that when Barriercoat is applied, the solvents evaporate, leaving only the original resilient base gum.

Barriercoat can be applied by brushing, spraying, or troweling, and the manufacturer states that it will not sag, rot, disintegrate, chip, or peel. Colors available are black, maroon, green, or aluminum.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 78.

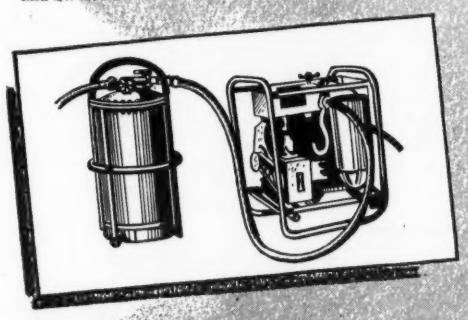
LOW COST WATER PURIFICATION

for clear clean drinking water



Water Distillation Unit—This equipment is adaptable to many uses by industry and small field organizations. Some units are trailer mounted fully equipped with tires, ready to move to the working locale; other units are portable, neat, compact and mounted on skid-type frames. Unit consists of a gasoline engine, steam compressor, and other parts and necessary piping all assembled and mounted on a structural steel base. Most of the units need no direct fired fuel burning equipment. A few units have oil burners. Available in "unused" and "used" condition at WAA Regional Offices listed below.

Location: Trailer mounted type: Atlanta, Los Angeles, Nashville, New Orleans, New York, Richmond, Salt Lake City and San Francisco. Location: Skid-mounted type: New York, Richmond, Salt Lake City, San Antonio, San Francisco and St. Louis.



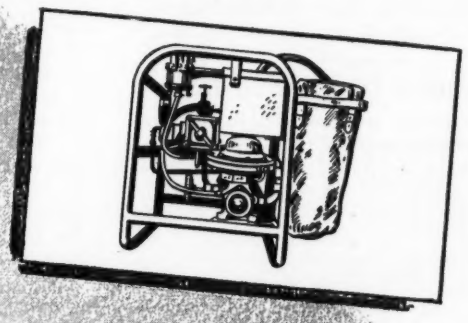
Portable Water Purification Unit (Mobile)—Converts impure water into clear, clean drinking water. The equipment can be cleaned easily with little loss of operating time. Consists mainly of a pumping unit and a filter unit. The water is cleaned by harmless chemicals. Forcing water reversely through the filter, washes the unit thoroughly. Available in "unused" and "used" condition at WAA Regional Offices indicated below.

Location: Birmingham, Charlotte, Houston, Jacksonville, Kansas City, Little Rock, Los Angeles, Nashville, New Orleans, New York, Richmond, St. Louis, Salt Lake City, San Antonio, San Francisco, Seattle and Spokane.

Here's the equipment you need for quick, simple, Water Purification, Chlorination, or Distillation. Made by well-known manufacturers to high industrial standards, this equipment is now available to you in compact mobile and portable units—simple to install, easy to adjust, and priced far below cost. If you want to buy one of these units—or all three types for a complete conditioning plant—contact Chief, Sales Section 67, at the Regional Office holding the inventory. You'll get complete description, specifications, types of equipment available, prices and other pertinent data. Write, phone, or visit your nearest Customer Service Center or Regional Office.

All purchases are subject to the War Assets Administration's standard conditions of sale, and all items are subject to prior sale.

Priority claimants have already had an opportunity to fulfill their requirements. Arrangement for inspection of these units may be made at any Regional Office where inventory is located.



Hypo-Chlorination Unit (Automatic)—This equipment efficiently chlorinates from 2 to 100 gallons of water per minute. The chlorine feed can be proportioned over a range of 10 to 1 for any one setting of the adjusting valve. Unit consists of hydraulic operated hypochlorinator, water meter, pressure regulating valve and manual range adjusting valve. Installation is simple—just connect the unit into the water line. Available in "unused" and "used" condition at WAA Regional Offices indicated below.

Location: Houston, Nashville, New Orleans, New York, Richmond, Salt Lake City, San Francisco and Spokane.

OFFICE OF GENERAL DISPOSAL

WAR ASSETS ADMINISTRATION

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago Cincinnati • Cleveland • Denver • Detroit • Grand Prairie, Tex. • Helena • Houston Jacksonville • Kansas City, Mo. • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans New York • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City San Antonio • San Francisco • Seattle • Spokane • Tulsa 1123

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Your "CATERPILLAR" Dealer is your MARTIN Dealer. See him for your trailer needs.

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"Make Hauling A Pleasure!"

Ease of loading, dependability and economical operation are three Martin CARRYHAUL Trailer characteristics which make them the leaders in the field.
Regardless of your hauling job, there's a proper size Martin CARRYHAUL Trailer to do it for you safely and economically.

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Name _____
Firm _____
Position _____

Peterbilt trucks are made in both truck and trailer combinations and tractor-type trucks, depending upon the job they are to do. The company makes an analysis of the job requirements and sets up the truck wheelbase to give proper load distribution.

Job-Tailored Trucks For Heavy-Duty Work

A line of custom-tailored trucks is produced by the Peterbilt Motors Co., 107th Ave. and MacArthur Blvd., Oakland 3, Calif. An analysis is made of the job, and the wheelbase is set up for that particular job to give the proper load distribution on the front and rear axles.

The trucks are made in both truck and trailer combinations and tractor-type trucks, depending upon the operation which they are to perform. These units are furnished with a Cummins 150 to 200 or 275-hp diesel engine, a Hall-Scott 400 Series gasoline engine developing 290 hp, or a Hall-Scott 400 Series butane engine developing 325 hp. Tire sizes range from 10:00 x 20 to 14:00 x 24, depending upon requirements.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 43.

Bitumen-Distributor Data

A complete description of its MX line of bituminous distributors is contained in Bulletin No. 508BB of E. D. Etnyre & Co., Oregon, Ill. These units are available with either front or rear engine drive.

The bulletin lists complete specifications for both standard and auxiliary equipment: tank and fittings, pump, power unit and transmission, circulating system, heating system, spray bar and nozzles, hand spray, controls, instruments, loading hose, portable burner and burner cleaner, strainers for manhole, intake and discharge, etc.

On the last page of the bulletin is a table which gives standard tank capacities, weights, and mounting data for the Model MX distributors. Featured in the announcement is a description of the various styles of spray bars which are obtainable with the unit.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 75.

Equipment for Testing Construction Materials

Testing equipment for road materials, cement, soils, asphalt, concrete-reinforcing bars, etc., is described in Bulletin 31 issued by the Tinius Olsen Testing Machine Co., 500 No. 12th St., Philadelphia 23, Pa.

The bulletin describes hydraulic compression-testing machines and L-Type universal testing machines. The former are made in capacity ranges from 60,000 to 1,000,000 pounds; the latter from 60,000 to 300,000.

Two other pieces of equipment described are an automatic cement tester and a portable hydraulic compression-testing machine. The cement tester is designed for making tensile tests on briquettes, and is made in 1,000 and 2,000-pound capacities. The portable machine is designed for making compression tests on 6 x 12-inch concrete cylinders. The gage readings indicate loads from 30,000 to 200,000 pounds.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 71.

Macwhyte Sales Head

Immediately following the annual meeting of stockholders of the Macwhyte Co., wire-rope manufacturer of Kenosha, Wis., the directors elected Robert P. Tyler as Vice President in Charge of Sales. He was formerly General Sales Manager.

Snap-on Opens in Fargo

Its 40th factory outlet has been opened by the Snap-on Tools Corp., Kenosha, Wis. The new outlet is located at 421 N. P. Ave., Fargo, N. Dak. Louis J. Johann, formerly a fieldman with the Minneapolis branch, will manage the Fargo office.

Aerial-Survey Symposium

A recent publication describes how large areas of ground can be surveyed from the air, and topographic maps made to 2, 5, 10, or 20-foot contours from aerial photographs, at a saving over the cost of conventional ground surveys. It has just been issued by the Aero Service Corp., 236 E. Courtland St., Philadelphia 20, Pa.

This symposium of articles by well known highway officials describes how this type of contour map, developed from aerial-survey photographs, has been used with economy of money and time in determining the most feasible location for highways.

This aerial-survey technique, known as the Brock method, was used in surveying plant sites before and during the war. It is pointed out that the same basic method is applicable to flood-control and reservoir surveys, etc.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 59.

*Nationally known Keystone Asphalt Mastic Board used also in Keystone Center Strip (tongue and groove) and Keystone Dummy Joints.

State Highway Departments in growing numbers are specifying practical Keystone Mastic Board as base plates under expansion and contraction joints to prevent pumping action and spalling. Michigan, always a leader in highway improvements is using the method illustrated above—placing the mastic board flat under the joints where it acts as a water seal for the subgrade and incidentally as a sand plate to help keep the wire supporting basket from sinking out of position during pouring. • Keystone Asphalt Mastic Board from ⅛" to ¼" thick is recommended for this type of installation. It is easy to cut and install—gives proper alignment to standard wire joint supporting baskets and load transfer units as well as preventing them from sinking into the subgrade. Completely prevents water seepage underneath the joints.

Write Keystone's Engineering Department today for complete information and detail drawings of mastic board base plate installations.

Ask about the NEW KEYSTONE EQUIPMENT LINE

KEYSTONE offers contractors a joint slitting machine, concrete curing compound spray machines and rubber asphalt joint sealing compound kettles at accepted manufacturer's prices. Write or wire.

KAP

KEYSTONE ASPHALT PRODUCTS COMPANY
A Division of the American-Marietta Company
43 E. Ohio Street, CHICAGO 11, ILLINOIS

For flexibility in **ROAD IMPROVEMENT**

...Before and After with BITUCOTE...

Bitucote Emulsified Asphalt is applied without heating apparatus and with only ordinary road equipment to any type of road construction. For resurfacing and for new construction, for low cost minimum paving and for heavy duty, rigid specification paving—there's a Bitucote Emulsified Asphalt to fit each job—Penetration, Road Mix, Pre-Mix, Surface Treatment and Base Stabilization.

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Write for booklet—
"Pave It Better With Bitucote"

CAMDEN, N. J. • CINCINNATI, OHIO
EL DORADO, ARK. • ST. LOUIS, MO.

1414 Central Industrial Drive
St. Louis 10, Mo.

The new Maginnis Hi-lectric concrete vibrator has an electric motor built into its head. Its generator, which is connected to the vibrator with a lightweight cable, can be set up off the job and out of the way.

Motor Built in Head Of Concrete Vibrator

A new concrete vibrator which features an electric motor built into its head is being manufactured by the Maginniss Power Tool Co., 129 Distl Ave., Mansfield, Ohio. The head and operating hose are a self-contained unit and power is transferred from the source of supply by means of an electric cable. The unit is said to produce 9,500 vpm.

The Hi-lectric vibrator operates on a 110-volt 3-phase 180-cycle current, and either gasoline-powered or electric generators are available. The unit has a wheelbarrow-type mounting and is readily portable. It is not necessary to move the generator for each use, as the head may be used as far away as the length of cable employed.

The head is 2⅜ inches in diameter, and can be equipped with an operating hose 5, 10, or 15 feet long. The electric cable is Type S heavy-duty Neoprene-covered No. 12-4 conductor cable. The standard generator will operate two vibrator units, and up to 25 can be run by one larger-capacity generator.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 26.

New Lights for N. J. Route

Further advancing his plans to lessen death hazards on the heavily traveled Route No. 4, New Jersey State Highway Commissioner Spencer Miller, Jr., has approved continuous lighting from the George Washington Bridge, Fort Lee, to the Passaic River at Paterson.

To obtain the increased light it will be necessary to have 438 lamps. This will require 204 new units, 193 of 4,000 lumens and 11 of 6,000 lumens. It will also mean the restoration of 76 lamps which were taken out of service during the wartime driving curtailment. The pre-war spacing of 400 feet between poles will be reduced to 175 feet.

Steel Stealers Stuck

The recovery of $2,900 for steel stolen from a bridge project of the Kentucky Department of Highways has been disclosed by Commissioner J. Stephen Watkins. The steel was removed from the old Salt River bridge at West Point, Ky. Replaced by a new 4-lane span, it had been dismantled and its steel scheduled for use elsewhere.

In commenting upon it, Mr. Watkins said, "Removal of Highway Department property for private use is not uncommon. Our legal section has been instructed to take immediate steps to prosecute vigorously where instances of this kind occur. Thefts of stone, asphalt, steel, and lumber have been reported. The Department will instantly prefer charges against those who are guilty of such thefts."

Investigations conducted by the Highway Patrol resulted in charges against Aubrey Woehrle for the theft, and Eugene Beeber, proprietor of a scrap-metal agency, for receiving stolen goods. Both men entered pleas of guilty and were given 6-month suspended sentences after agreeing to full restitution.

Smooth, non-grabbing action that adds countless miles to tire life.

Balanced holding power for positive stopping under all conditions.

No let-down in efficiency on steep grades or under prolonged use.

Long wear life with fewer adjustments to keep 'em on the road.

These are some of the advantages afforded by GATKE *CUSTOM-BILT* Brake Blocks, that make a world of difference in meeting today's tough maintenance requirements.

Ask your GATKE Jobber or write.

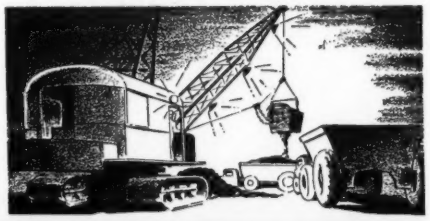
GATKE *Custom-Bilt* BRAKE BLOCKS for all APPLICATIONS

Gatke CUSTOM-BILT BRAKE LININGS

BLOCKS SETS ROLLS SHEETS

GATKE CORPORATION

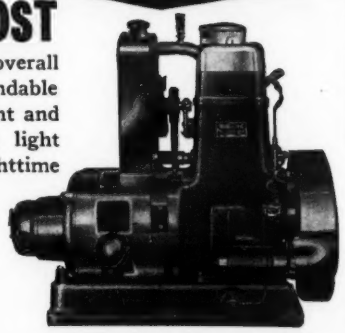
228 N. La Salle St., Chicago 1, Ill.



Performance Proved WITTE DIESELECTRIC PLANTS Trade Mark Reg.

PRODUCE YOUR OWN ELECTRIC POWER AT COST

Maintain schedules more easily, reduce your overall costs and time on jobs with continuously dependable WITTE Dieselectric power for your equipment and for lighting. Abundance of steady, strong light means higher safety and work output on nighttime jobs, as you well know.



7.5 KVA WITTE DIESELECTRIC with heavy duty generator

Another type of WITTE 7.5 KVA DIESELECTRIC

Simple, occupying little space, WITTE Dieselectric Plants are *full* Diesels . . . start readily and operate on the same low-cost fuel as your Diesel tractor. Keep costly gasoline off the job! Fuel consumed for WITTE Dieselectric power production ordinarily averages about 1c per kilowatt hour. Remember, Dieselectrics are made only by WITTE and world-wide WITTE Dealer-service matches their famed dependability. Every WITTE Dieselectric and WITTE Diesel Engine is 100% factory-tested for power and performance. Vertical and horizontal sizes from 3 to 10 KVA—there's a WITTE Dieselectric that exactly meets your needs. Can also be obtained as original powering installation on equipment. Ask your shovel or drag-line supplier. Write for new WITTE Catalog *now*.

WITTE ENGINE WORKS

DIVISION OF OIL WELL SUPPLY COMPANY — UNITED STATES STEEL CORPORATION SUBSIDIARY

AMERICA'S PIONEER BUILDER OF SMALL DIESELS — KANSAS CITY 3, MO., U.S.A.

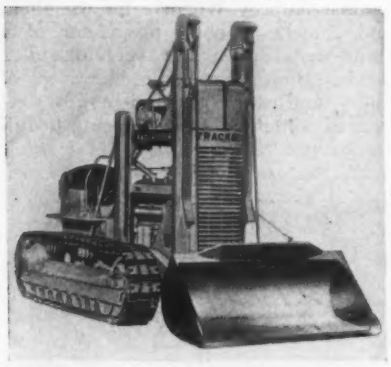
PILE HAMMERS and EXTRACTORS

On construction projects of unlimited variety, McKiernan-Terry Pile Hammers and Pile Extractors have for the past fifty years been building a world-wide reputation for speed, power, safety and dependability. Greatly expanded manufacturing facilities now make possible prompt deliveries of double-acting hammers in ten standard sizes; double-acting extractors in two sizes; single-acting hammers in five. For full information, write for free McKiernan-Terry Bulletins No. 55 and No. 57. MK-1006

McKIERNAN-TERRY CORPORATION

Manufacturing Engineers

19 Park Row — New York 7, N. Y.



Engineered as a unit with the Caterpillar D6 tractor, this new Model T6 Traxcavator is available also with an interchangeable bulldozer blade.

Tractor-Excavator Made in New Size

The addition of a new model to its Traxcavator line brings to four the number in this line made by the Tracklson Co., 3333 So. Chase Ave., Milwaukee 1, Wis. The Model T6 is engineered as a unit with the Caterpillar D6 tractor. Buckets of 1½ or 1¾-yard capacities are standard, with other types available for special uses. Bucket sizes in the full line range from ½ to 4 cubic yards.

Lifting height of the T6 is 9 feet 10 inches from the ground to the bottom of the bucket, with a dumping clearance of 8 feet. Dumping can be accomplished at any height within the lifting range. Designed to handle many dirt-moving, digging, and material-moving problems, the T6 is available also with an interchangeable bulldozer blade.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 7.

Shallow Tread Cuts Need No Vulcanizing

An economical method for repairing shallow tread cuts in truck and off-the-road tires has been discovered by The Goodyear Tire & Rubber Co., Akron, Ohio. Cuts which do not penetrate the fabric plies do not particularly harm a tire, the company points out. The real danger comes from stones, gravel, and other foreign objects. These become wedged in the cut and continue to work into or through the tire by forces of tread flexing and road impact.

Steps in the repair method: first, probe the cut to remove all foreign material; then, with a sharp-pointed knife or rasp, trim out or grind around the cut to form a cone-shaped cavity extending to the bottom of the cut. The angle of this skive or bevel should be no more than required to prevent future wedging of foreign material in the cavity; it must not extend in depth beyond the breaker. Usually 30 to 45 degrees is the maximum angle required.

After the cuts have been trimmed out in this manner, the tires can be continued in service without impairment of service life or extension of the cut. Full advantage of this method of treating shallow cuts can be realized through frequent inspection of tires to remove stone, glass, and other foreign substances. Such inspection will also detect the deeper, more serious cuts which require early vulcanized repairs. Previously, it was recommended that all shallow tread cuts be vulcanized.

New Battery Charger

A portable battery charger designed for shop, airport, and on-the-job use has been announced by Thomas A. Edison, Inc., Kearny, N. J. The charger weighs approximately 50 pounds and is designed to deliver 80 amp to a 6-volt battery. It will operate on a 105 to 125-volt 60-cycle single-phase alternating current.

The Model EC-9 is 21 inches long, 11¾ inches wide, and 12¼ inches high. An hour time switch for automatically cutting the charge at a predetermined time is standard equipment. The charger has a glass-insulated transformer built for 110-volt 60-cycle ac primary with four coarse and four fine primary taps. The rectifier is a G-E selenium. A 15-amp fuse in the extractor post is mounted on the panel for easy accessibility.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 15.

Jahn Opens New Factory

The opening of its new factory at Savanna, Ill., has been announced by the C. R. Jahn Co. of Chicago, Ill. Savanna is located 135 miles west of Chicago. The new building was designed for the production-line method of manufacturing heavy-duty trailers. Executive and sales offices will remain at the present Chicago address.

Unit Seeds, Rakes, Rolls

A machine which seeds, rakes, and rolls in one operation is described in a broadside issued by P. L. Byers, Clyde, Ohio. The Byers Seeder is made in two models, both of which are described in the announcement. The Model No. 1 is designed for use in roadside-development and airport work, and similar projects. The Model No. 2 is a smaller unit designed primarily for lawns and jobs of comparable size.

All dimensions, details, and features are pointed out, the principle of operation is described, and other information is included.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 67.

Acme Eastern Sales Head

L. J. Amsdell has been appointed Eastern Sales Manager for the Acme Rubber Mfg. Co., Trenton, N. J. He will make his headquarters at the company's New York offices in the Woolworth Bldg., 233 Broadway. Mr. Amsdell formerly was Western Sales Manager.

You can quickly and profitably trowel a smooth, resilient, long-lived surfacing right over that old concrete or wood floor.

with PLASTIC ROCK!

Plastic Rock comes complete, packed in barrels. Nothing more to buy. No application "formula" to confuse. Simply mix and trowel right over old floor; average depth one-half inch. Old floor Saturday is a new floor Monday. Plastic Rock is absolutely spark-proof, skid-safe even when wet, dustless, silent. Feels like cork under foot. Cannot splinter, crack, crumble, curl or loosen. Also patches concrete to a perfect feather edge. Heavy loads on steel wheels actually improve it. Five-year-old floors show no wear. Used by largest railroads and industries in America. Over 600 contractors have found Plastic Rock a good-will builder and profit source. No special equipment needed. Not for home use.

Ask for comprehensive and convincing Report 220-C-6

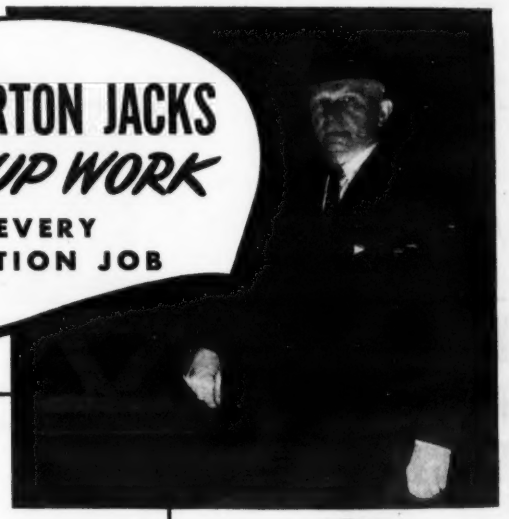
UNITED LABORATORIES, INC.
16815 EUCLID AVENUE • CLEVELAND 12, OHIO
In Canada — STORRAR MFG. COMPANY, Weston, Ontario
Representatives everywhere, including foreign countries

DOWEL ALIGNMENT BEING CHECKED BY SPIRIT LEVEL

HIGHWAY DEPARTMENTS REQUIRE DOWEL ALIGNMENT CHECKED BEFORE CONCRETE PLACING.
LACLEDE DOWEL SPACERS ALIGN DOWELS HORIZONTALLY, AND VERTICALLY ON ALL TYPES OF SUBGRADES AND MAINTAINS EXACT ALIGNMENT DURING CONCRETE POURING.
ELIMINATE COSTLY FIELD ADJUSTMENTS—USE LACLEDE DOWEL SPACERS.

LACLEDE STEEL COMPANY
ST. LOUIS, MISSOURI

DUFF-NORTON JACKS SPEED UP WORK ON EVERY CONSTRUCTION JOB



Contractors and construction engineers find Duff-Norton's complete line of Jacks ideal for building or repairing bridges, constructing or wrecking buildings, rigging and all heavy lifting, lowering, pushing or pulling of steel girders, plate, machinery, etc. required on construction jobs.

THE DUFF-NORTON MFG. CO.
PITTSBURGH 30, PA.
SEE YOUR ASSOCIATED EQUIPMENT DISTRIBUTOR

WRITE for Catalog 203A, for complete data on jacks that help speed up construction jobs.

This clock is one of the devices Koss Construction Co. uses to remind its men constantly about safety. Here it records a Des Moines, Iowa, airport job which was completed in 90 days without a lost-time accident.

Is Your Highway Job Organized for Safety?

(*Continued from page* 1)

example, may stretch out over an area of 5, 10, 15, even 20 miles. And it is very hard to keep an eye on all of the employees who are working over this large area. With such a set-up it is particularly necessary that not only the superintendent be sold on the safety idea, but also the foremen and other key men who are at various points of operation. These men keep a lookout for any unsafe practices and they are a very important factor in our safety program. They are working close to the men, and if an employee is careless or is following an unsafe practice they are the first to see him.

The Hazard of Green Workers

Another safety problem that we have on highway work arises from the relatively large number of green and inexperienced laborers. Many of these men have never been around a highway or airport construction job. They are not familiar with the types of equipment and, in many cases, the high speeds at which they run. They have not been on the jobs long enough to know by sight and instinct what practices are to be avoided as unsafe. For this reason we are in constant apprehension that an inexperienced employee will cause injury to himself or to his fellow workmen. He takes a lot of looking after during the first few weeks he is on the project. We know this to our sorrow, for we have had very bad accidents occur when an employee has been on the job less than a day.

These two reasons then—the area over which the normal job is spread and the fact that there are many green employees on the job—make the safety program most essential.

We achieved a very good rating in frequency of accidents in 1946 and we look for further improvement in 1947. Actually our '46 record was almost as good as it could be. But there was one exception, a fatality. One of the green employees I have spoken of stepped behind a moving loader and was crushed before the operator could stop the machine. Despite the large warning signs we place on all moving equipment, we will always have to be vigilant in this matter. And our top personnel will continue to study accident reports for corrective measures.

Safety Is Everyone's Concern

We do not have a full-time safety engineer. The writer works with the superintendents on safety in the same way as on other matters pertaining to the project. The superintendent, in turn, uses the field organization to get the results. In our particular case this method has been entirely satisfactory.

We have been a member of the National Safety Council, Inc., 20 No. Wacker Drive, Chicago, Ill., for many years. And we feel that every contractor, regardless of the size of his operations, can secure much assistance from this non-profit organization. It gives individual contractors the instructions and materials necessary to carry on a safety program. We are very much impressed with the way it has been handling the safety program and wish to give it the credit which it deserves.

It should be remembered, I think, that the construction industry is competing with a number of other industries for available skilled and unskilled workmen. I feel that a workman is more satisfied if there is evidence that the company is interested in his welfare, and that it is willing to spend some time, a very small amount of money, and some energy to give him a real safety program.

Drafting-Room Equipment

The tenth edition of its general catalog is now available from The C. F. Pease Co. of Chicago. It contains 238 pages of information on the company's line of blueprinting machines and accessories, whiteprinting (dry direct process) machines and accessories, sensitized papers and cloths, drafting-room furniture, and photographic arc lamps. The equipment described covers a wide range of drafting-room needs.

The book has diagrams and more than 150 illustrations, including full-views, cutaways, and close-ups. It describes applications and gives detailed information regarding measurements and weights of equipment. The book is divided into seven sections, and is thoroughly indexed.

Copies of this literature may be obtained by writing a request on your letterhead addressed to the company at 2601 W. Irving Park Road, Chicago 18, Ill. Or use the enclosed Red Request Card. Circle No. 52.

A new, light, compact, easily-installed engine of wide power range. Completely "De Luxe" equipped, easy-to-get-at controls, and many other *plus* points. Prompt delivery on early orders.

ONAN ELECTRIC PLANTS—A.C.—350 to 35,000 watts in standard voltages and frequencies; D.C.—600 to 10,000 watts, 115 and 230 volts. Battery chargers—500 to 6,000 watts, 6, 12, 24, 32 and 115 volts. ONAN AIR-COOLED ENGINES—CK: 2-cylinder opposed, 10 h.p.; BH: 2-cylinder opposed, 5.5 h.p.; 1B: 1-cylinder, 2.5 h.p.

- **HEAVY-DUTY CONSTRUCTION:** Short, sturdy crankshaft. Extra-large bearings.
- **SMOOTH POWER:** Opposed 2-cylinder design. Fully counter-balanced crankshaft.
- **SUPER COOLING:** Axial-flow fan delivers 600 cu. ft. of cool air per minute. Larger fin area.
- **ALUMINUM CONSTRUCTION:** High-strength aluminum castings reduce weight.
- **ELECTRIC STARTING AVAILABLE:** Built-in electric push-button or automatic starting.
- **COMPACT, LIGHT WEIGHT:** Fits into 15 x 19 x 18 inch space. Weighs only 97 pounds.

Onan PRODUCTS

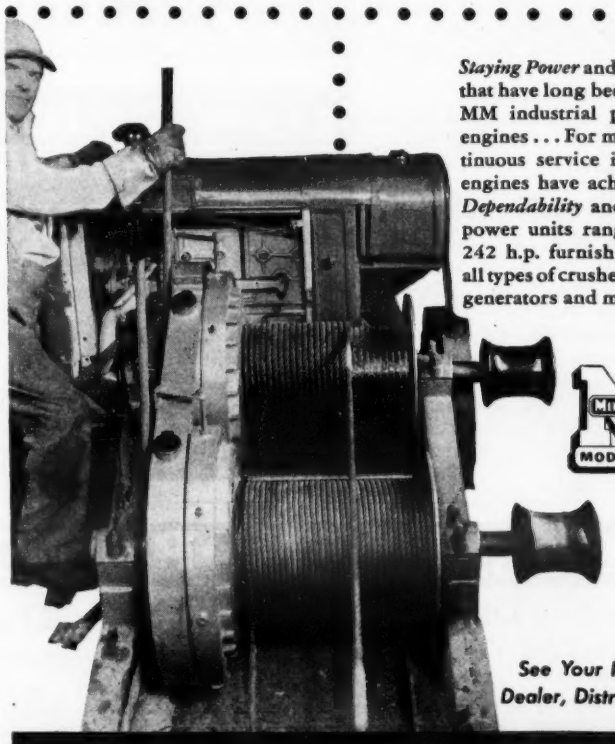
WRITE FOR SPECIFICATIONS

D. W. ONAN & SONS INC.
3471 Royalston Ave. Minneapolis 5, Minn.

ONAN 4-Cycle ENGINES

FIRST FOR

STAYING POWER



Staying Power and *Service* are terms that have long been identified with MM industrial power units and engines . . . For many types of continuous service installations MM engines have achieved records in *Dependability* and *Economy* . . . 7 power units ranging from 20 to 242 h.p. furnish ideal power for all types of crushers, hoists, pumps, generators and many more uses.

MINNEAPOLIS-MOLINE MM MODERN MACHINERY

See Your Nearest M-M Dealer, Distributor or Write

MINNEAPOLIS-MOLINE
POWER IMPLEMENT COMPANY
MINNEAPOLIS 1, MINNESOTA

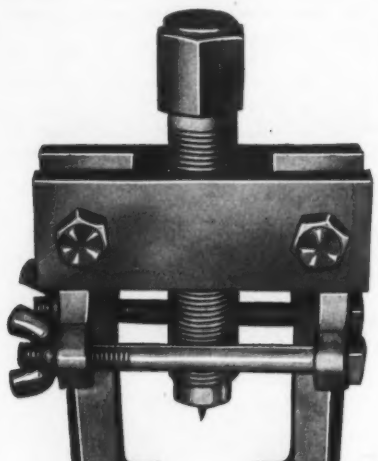
NOT THIS-

BUT This!

with Silver STEERING BOOSTER

Fingertip pull on clutch steering levers opens clutches FULL TRAVEL. Ends frequent repairs to clutches, throwout bearings and brakes. Skinners do more and better work because angle-dozing, following contours and steering big crawler tractors does not mean sore muscles and exhaustion at the end of the day. For all crawler tractors. Installed on approval by your dealer.

Silver BOOSTER MANUFACTURING CO.
1406 SOUTH GRAND AVENUE
LOS ANGELES 15, CALIFORNIA Richmond 6191



The new OTC pitman-arm puller operates on practically all trucks. The puller arms are drop-forged.

Pitman-Arm Puller

A new tool of interest to truck operators has recently been announced by the Owatonna Tool Co., 348 Cedar St., Owatonna, Minn. Listed as the pitman-arm puller No. HC-642, it is said to be capable of pulling the pitman arms on practically all makes of trucks. Adjustable to size, it is short-coupled enough to get into restricted quarters. The puller arms are drop-forged.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 11.

Forging-Hammer Catalog

A catalog describing its line of heavy-duty forging hammers is being distributed by the firm of C. C. Bradley & Son, Franklin and Goodwin Sts., Syracuse, N. Y. The Bradley hammers are made in four general types: the compact hammer which is designed for general blacksmithing work; the upright strap hammer; the upright helve hammer; and the rubber-cushioned helve hammer. The latter is designed primarily for large commercial operations in the drawing of steel.

Each type of Bradley hammer is illustrated with a photograph, and this is accompanied by complete specifications and a discussion of operational features. Three pages of the catalog are devoted to a short history of the development and processes of forging metals.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 60.

King to Denver Branch

The appointment of K. J. King as Manager of its Denver branch office has been announced by the Western Machinery Co. of San Francisco, Calif., distributor of construction equipment. The Denver offices are located at 1004 Speer Blvd. Previous to this appointment, Mr. King had been Assistant Sales Manager and Office Manager for the company's San Francisco sales office.

Rods for Improved Cast-Iron Welding

An electrode which is said to put cast iron in a class with steel for ease of welding and finishing has been announced by the Harnischfeger Corp., Welding Division, 4400 W. National Ave., Milwaukee 14, Wis. It is made to operate on either ac or dc. The company's engineers say that the new P&H Nicast electrode will produce welds which are strong, non-porous, and fully machinable in both the weld and fusion areas.

It is also said that because of their machinability, welds made with Nicast can be drilled, tapped, milled, or machined in any manner, shape, or form. Most applications are said to require no pre-heating or post-heating, and welds produced will withstand hydrostatic pressure. Nicast is an all-position electrode and performs in flat, vertical, overhead, or horizontal work. At present, it is available in ⅛ or 5/32 x 14-inch sizes.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 18.

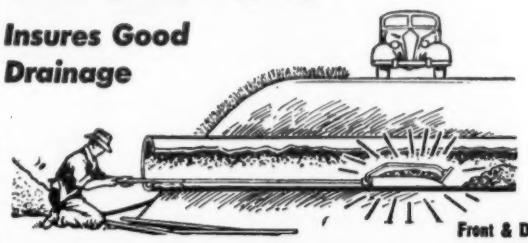
Destroys Wood Destroyers

Timely information on the habits and elimination of wood-destroying insects is contained in Folder 46-T on Penta preservative made by the Chapman Chemical Co., 333 No. Michigan Ave., Chicago 1, Ill. The folder describes how the pests operate and presents evidence to show the effectiveness of Penta preservative (5 per cent pentachlorphenol in petroleum solvent).

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 76.

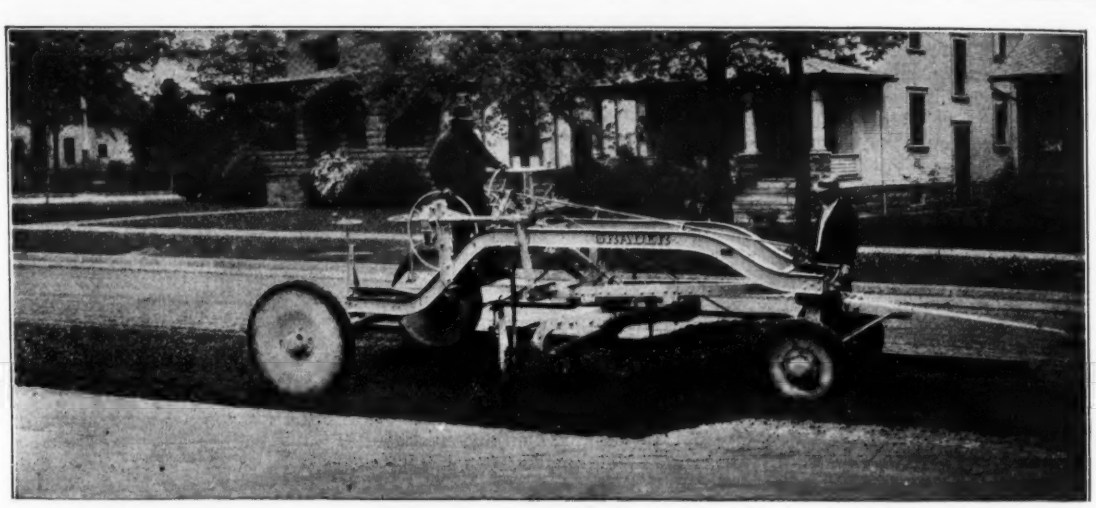
MORCO CULVERT CLEANER

Insures Good Drainage



Restore clogged culvert pipes to service with the "Morco" Culvert Cleaner. Quick-acting, non-damaging, easy operating "Morco" is the most satisfactory tool yet developed for this work.

MONARCH ROAD MACHINERY COMPANY
Front & Douglas N. W., Grand Rapids 4, Michigan

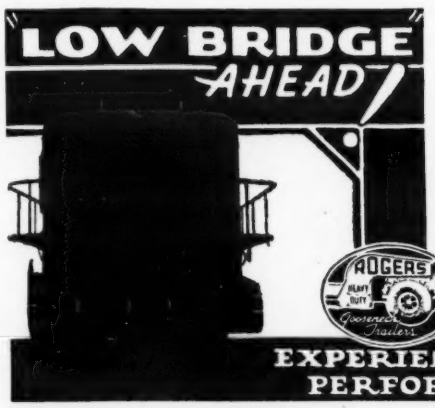


GLEDHILL Road Adjuster Attachment
(Mounted on Drawn Grader)

Easily attached to any drawn grader or motor grader. The three patented features of the Gledhill road adjuster attachment—straightedge, spirit level, blade and apron arrangement, will operate perfectly on any grader.

WRITE FOR DETAILED SPECIFICATIONS

The Gledhill Road Machinery Co. GALION, OHIO



the answer to that problem is this
ROGERS GIRDER-TYPE TRAILER

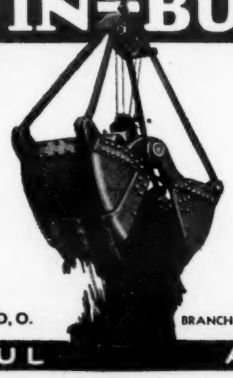
Rogers builds trailers for unusual needs, embodying characteristic features of fundamental design, but modified to meet special requirements. With a Rogers Girder Type Trailer there is slight chance of being confronted with a headroom clearance problem. Special construction affords an unusually low bed.

ROGERS BROTHERS CORPORATION
108 ORCHARD ST. ALBION, PA.

Owen SELLS "IN-BUILT" PERFORMANCE

Distinctive Digging Features

Deep penetration by bucket teeth—Balance maintained during digging—Undiminished closing power—Shells closed with maximum leverage—Adjustable closing speed—Easy complete discharge.



Durability with Long Life

Rigid shell construction—High carbon alloy steel teeth—Dropping shocks absorbed by Owen patented stops—Sealed grit-proof center shaft bearings—Protected cables and sheaves—Lever type arm bracket exert maximum leverage in forcing shells into the material.

THE OWEN BUCKET CO.
6030 BREAKWATER AVE., CLEVELAND, O.
BRANCHES: NEW YORK, PHILADELPHIA, CHICAGO, BERKELEY, CALIF.
A MOUTHFUL AT EVERY BITE

Keep On

BUYING BONDS

★ ★ ★ ★

DON'T SKIMP!

State Locates Roads From Aerial Surveys

Purchases Aerial Surveys From Private Companies And Trains Key Engineers In Use of Aerial Photos

✦ THE wider use of aerial surveys is a reality in the Texas State Highway Department—and not just wider in area covered, either. With a special short course on the interpretation and use of aerial photographs tucked safely away in their minds, about eighty key engineers from all parts of the state are using this fast, accurate method for much preliminary location work.

The Department has found that photogrammetric surveys open up a rapid new method for highway planning. Aerial photographs save time, money, and man-power on reconnaissance, drainage-area studies, and the development of highways through and adjacent to cities and towns.

In February of 1946 the State felt that the value of aerial mapping to highway planning warranted paying the expenses of many key engineers while they received a special short course conducted by Abrams Aerial Survey Corp. at the University of Texas. Proper interpretation of photographs with the aid of the stereoscope was one of the principal phases stressed.

State Uses Private Service

The Texas Highway Department feels it can best secure clear, accurate aerial mapping by purchasing at reasonable cost the aerial surveys made by private agencies. Practically the entire state of Texas has been flown in recent years by private aerial-mapping companies or the U. S. Department of Agriculture. Photographs made from these flights are available at a reasonable cost on practically any scale or form desired.

The type and scale of maps ordered depend entirely on the purpose for which they are intended. For route, location, and drainage-area studies in rural areas, maps on a scale of 1 inch equals 1,000 feet are ordered, together with contact prints for stereoscopic study at critical points. These maps are usually prepared in the form of quarter-grid sections, 3.75 minutes of latitude and longitude, with butt edges to match. Or they are prepared as linen strip maps suitable for rolling. The choice depends on their intended use and the preference of the engineer responsible for the survey.

In the highly developed urban and metropolitan areas, mosaics on a scale of 1 inch equals 200 feet are very desirable. They more than justify the expense involved with the time and money they save. Engineers can scale a distance on one of these large-scale maps with amazing accuracy. Scaled distances between buildings, for instance, check out by actual measurement almost perfectly.

Practically all negatives made from previous flights are on a scale of 1 inch equals 1,667 feet. And mosaics prepared on a scale of 1 inch equals 1,000 feet are approximately the maximum enlargement that can be secured by reproduction without the loss of considerable detail. Texas has found that new flights at about 7,000 feet of altitude are necessary in order to get large-scale photographs with satisfactory detail.

Costs of Aerial Work

The controlled mosaics at 1 inch equals 1,000 feet are obtained at a cost of from $1.00 to $2.50 per square mile, depending on the date of the flight and the concern from which the pictures are secured. The Department of Agriculture furnishes individual enlargements of contact prints on an approximate scale of 1 inch equals 660 feet at a cost of $1.25 each.

The Texas Highway Department has purchased a considerable quantity of these reproductions and found practically all of them to be very good and without loss of too much detail. The Department of Agriculture also furnishes straight contact prints for about $0.30 each, and photo index maps prepared in sections from staple mosaics for $0.90 each. These prints are made on a scale of 2 inches equals 1 mile, and 1 inch equals 1 mile.

Frequently large-scale mosaics are needed for large-scale planning. In that case a scale of 1 inch equals 200 feet is generally used. That calls for new flights at relatively low altitude in order to show good detail. The cost of new mosaics is governed by several factors: primarily the scale of completed mosaics, size, location of mapping, and the availability of planes.

Recent maps obtained on a scale of 1 inch equals 200 feet average from $100 to $236 per square mile. Mosaics prepared on a scale of 1 inch equals 1,000 feet are usually made from photographs flown at higher altitude with much greater coverage per exposure. They can be purchased at considerably less cost, from $40 to $50 per square mile. Contact prints for stereoscopic study can be purchased for $0.30 each.

Mapping Procedure

When a new flight is required, bids are requested from aerial-photography concerns and contracts awarded on the basis of the lowest and best bid. The contract is supported by governing specifications and a sketch showing the area for which the photographs are desired. The unit-bid prices include all necessary flying equipment, labor, and materials required for the furnishing of photographs. They specify the quantity, type, scale, and quality of maps to be delivered.

Due to the varying scale of oblique photographs, Texas has been unable to use them where the scale of the mosaic

(*Continued on next page*)

Steel for Sale

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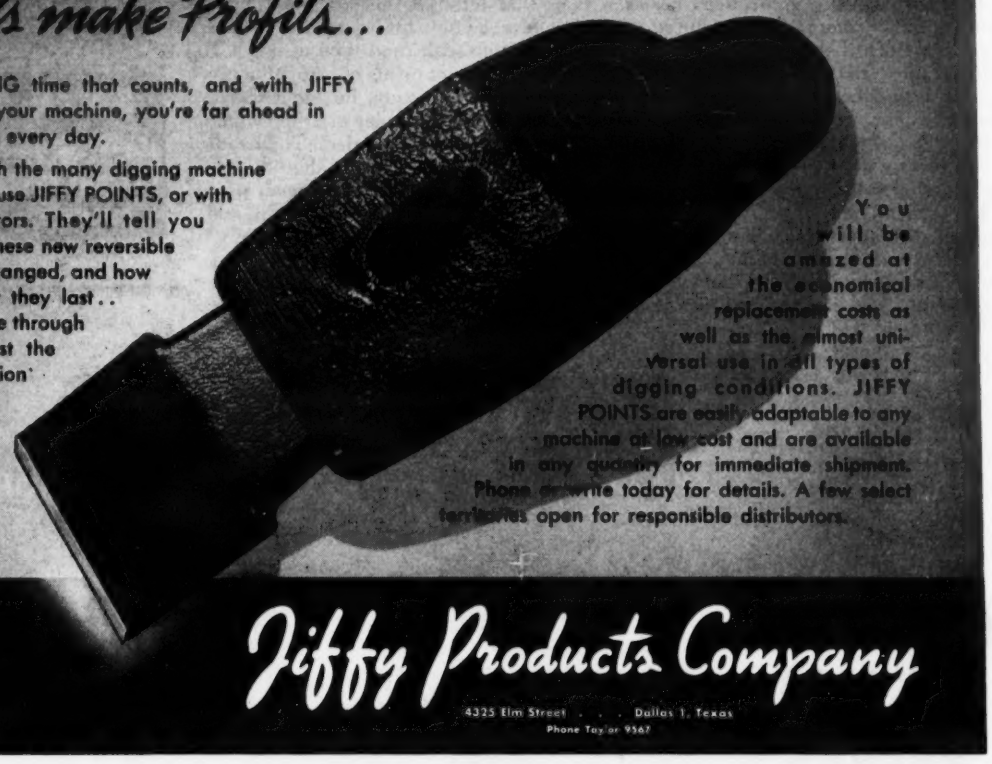

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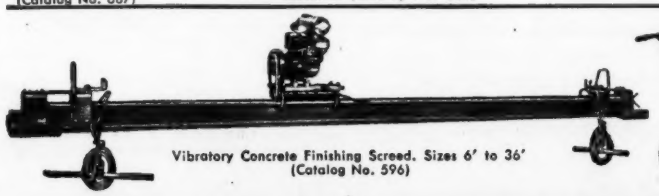
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DAYTON 1, OHIO

State Locates Roads From Aerial Surveys

(*Continued from preceding page*)

is of major importance. In the very early stages of planning, and in the preparation of perspective drawings, that type of photograph has been used to advantage.

Practically all photographs used by the Texas Highway Department are prepared in the form of controlled mosaics. Specifications require the mosaics to be prepared from vertical photographs, made with a single-lens aerial-mapping camera of approved design, having not less than a 12-inch focal-length lens. Specifications say that flight lines are to be flown north and south, or east and west, parallel to the boundaries of the area to be covered by the aerial photographs. In order to provide complete stereoscopic coverage, an average overlap of 60 per cent in line of flight with an average overlap of 30 per cent between parallel strips is required.

In preparing the controlled mosaic, the mapping company is required to show nine identifiable control points per photograph. Existing ground control points established by the U. S. Coast and Geodetic Survey are frequently used. The establishment and adjustment of this photographic net is done by the slotted-template method.

The control plot thus established is used to ratio individual photographs to a uniform and consistent scale. All control points used in the radial control layout must be located on the completed mosaic within 0.02 inch of their true geographic position. At least 90 per cent of all identifiable picture points in the photographic images of any features must appear within 0.05 inch of their true geographic positions. No identifiable picture point can be in error more than 0.1 inch and be acceptable.

Aerial-Map Use Increased

While the Texas Highway Department does not believe aerial survey will ever replace the detailed field surveys now required for final location and design of construction jobs, it does know that many of the ordinary mapping surveys for preliminary work can be largely eliminated. In addition to the special short course on the subject, letters have been written to all district engineers encouraging them wherever feasible and practicable to utilize this service.

Requests for aerial photographs from a district office are acted upon without delay. Photographs for an area previously flown can usually be delivered within two or three weeks, but in some instances may require as long as two months. Several months' advance notice is needed if a new flight is desired.

When a district engineer requests a map, his letter is accompanied by a sketch showing the area he desires covered, the scale, and type of maps. If he wants contact prints of critical points for stereoscopic study, he indicates on his sketch the particular area for which the photographs are needed. The headquarters office in Austin then determines whether the area has been previously flown, the date of the flight, and bid prices.

As urban areas become more settled, the date of original flights has become of ever increasing importance. Recently the State needed an aerial survey of the Houston city area. A new flight, with large-scale coverage, was required. The City of Houston needed the same information for the routing of utilities, sewers, and the new Houston Freeway. So the State of Texas and the City of Houston shared the cost of the survey.

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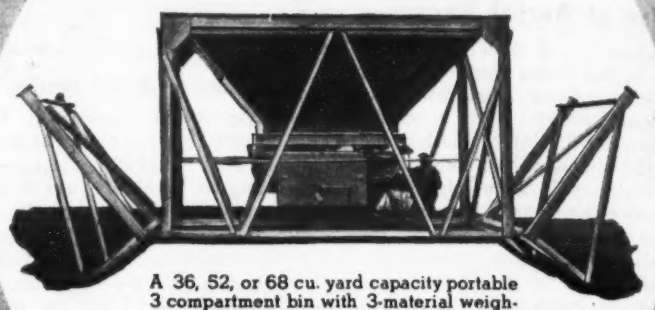
ERIE TYPE "G A" PORTABLE AGGREMETER PLANTS



A 36, 52, or 68 cu. yard capacity portable 3 compartment bin with 3-material weighing AggreMeter is the answer to the need for a sturdy economical batching plant that follows the job. These are available with wide hopper to discharge batch into compartment trucks or with special truck mixer charging hoppers. Hinged legs provided for quick erection in field. Write for Bulletin GA-1 for details.

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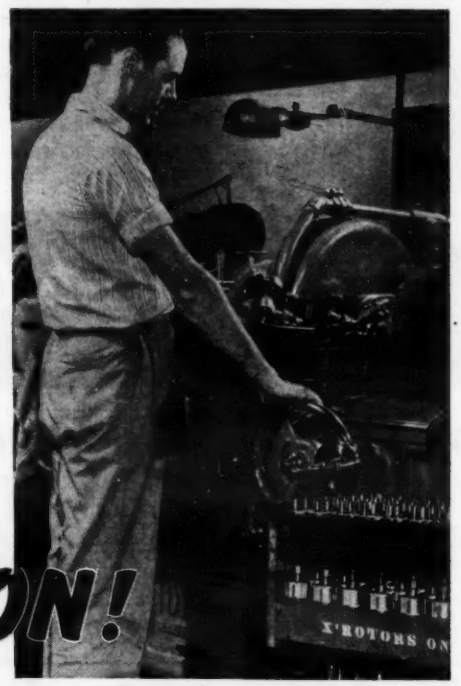
50 YEARS OF DEPENDABLE IGNITION

6,000 CONTACT BREAKS A MINUTE MEAN . . . FRICTION!



The breaker cam for the magnetic rotor on a WICO XH magneto must have a fine finish. The rotor revolves at a speed which may be anything between 200 and 3300 RPM, and the cam breaks the contact twice in each revolution on a multi-cylinder magneto. The finer the finish the less wear on the shoe — and a worn shoe will affect the spark timing. That's why infinite pains, on this fine grinder by an experienced man, are necessary to meet WICO quality standards. For WICO sparks, delivered thousands a minute, must be timed precisely.

This is just one of a score of operations that WICO's fifty years of magneto experience have developed to assure the finest magnetos built.

The postwar "X" models, the last word in magneto ignition, are all built to 1947 aircraft standards. The world's largest manufacturer of magnetos exclusively, WICO equips America's aristocrats in spark-ignited engines — and at great economy. Trained field engineers and more than a thousand authorized service stations sell WICOs and serve buyers and users everywhere. Wico Electric Company, West Springfield, Mass.

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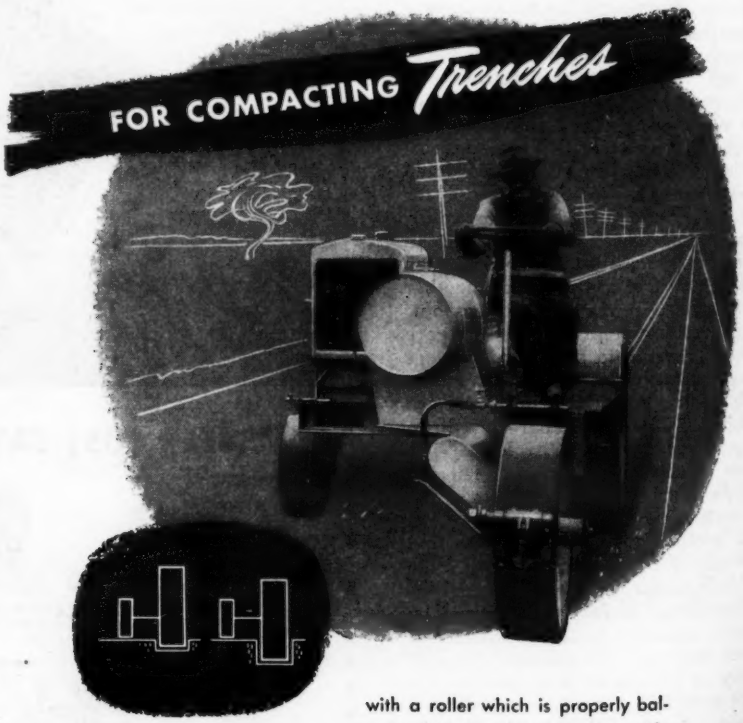
FOR COMPACTING Trenches



with a roller which is properly balanced, which is safe to operate without tipping, and which is designed specially for that job. A simple, hydraulically operated mechanism provides vertical adjustment for the road wheel so that the roller can be kept level when operating in the trench. This hydraulic unit is exclusive with Buffalo-Springfield trench rollers. Compressions exceeding 300 #/" of face can be obtained with this model. See your Buffalo-Springfield distributor for further details.

BUFFALO SPRINGFIELD — THE STANDARD OF COMPARISON

SPRINGFIELD OHIO

THE AMERICAN RED CROSS Carries On! GIVE!

A Koehring 304 crane, powered by a 3-cylinder General Motors diesel, is shown at work on a Florida drainage job. McCleod Construction Co. of Orlando, Fla., owner of the machine, prepared the land for use as a cattle pasture. Water in this area extends to within 2 or 3 feet of soil level.

Euclid Adds Department

A department to make field engineering studies for the improvement of current models and the development of new products has been established by The Euclid Road Machinery Co., Cleveland, Ohio. Known as the Sales Development Department, it will be headed by V. L. Snow.

White Engg. Sales Mgr.

H. Cliff Corwin has been made Sales Manager of the White Engineering & Mfg. Co., Inc., Rochelle Park, N. J., manufacturer of portable vapor steam cleaning equipment. Mr. Corwin was formerly Assistant Sales Manager of Manley Division, American Chain Co., York, Pa.

State Locates Roads From Aerial Surveys

(Continued from preceding page)

obtaining the complete data at remarkably low cost.

The greatest value, aside from low cost, to the highway engineers of Texas is the rapid and large-scale coverage of an area by one engineer with a stereoscope. With the critical shortage of good engineers during the past few years, aerial mapping has come into its own. It has become to the location engineer as valuable a tool as the slide rule. Both are regarded as checking or estimating instruments.

The use of aerial mapping was developed to a limited extent before the war, refined to a high degree of accuracy during the war, and will probably be broadened even more. As one of the most alert, wide-awake highway departments in the United States, Texas is using this advanced technique.

The Texas Highway Department is headed by D. C. Greer, State Highway Engineer, and the aerial-mapping work is directed by C. S. Kinney, Engineer of Surveys.

Vulcan Tools

A complete line for every type of Rock Drill, Pavement Breaker and Clay Digger.

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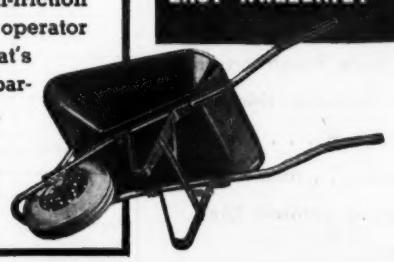
The demand for Sterlings continues to exceed the supply. Deliveries, however, will be stepped up as rapidly as conditions permit.

Well Balanced FOR EASY WHEELING!



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Dozer travel is 50% forward, 50% reverse, so the revolutionary new four-wheel-drive Tournadozer gives you approximately double the fastest crawler's forward speed and full range of *FORWARD SPEEDS IN REVERSE.*

Dozer work involves lots of shifting, so the high-speed Tournadozer has constant-mesh Tournamatic transmission . . . gives you instantaneous change of gear ratios forward or reverse, any time . . . any place. Just move lever to any gear selection you want and you're in it and *ON YOUR WAY . . . RIGHT NOW.*

Dozer duty is hard on tracks, so the new Tournadozer rolls on rubber . . . big tough tires 21.00 x 25. That cuts out a lot of track repair delays and materially *CUTS MAINTENANCE EXPENSE.*

Dozer jobs often get into soft going, so the big Tournadozer tires have tapered beads. That means low tire pressure . . . extra flotation . . . and lets you use extra low pressure to get *PLENTY OF TRACTION IN SAND AND MUCK.*

Dozer work has always been tough on the operator . . . Tournadozer operators ride easy on low pressure pneumatic tires . . . sit easy on hydraulic suspension seat . . . take it easy because air-actuated finger-tip controls *TAKE LABOR OUT OF OPERATING.*

Dozer travel often involved slow on-job moves and expensive haul from job to job. But the new Tournadozer goes anywhere on the job or *DRIVES JOB-TO-JOB FAST . . . AT 15 MPH.*

Check your LeTourneau Distributor for delivery. Order NOW.

Tournadozer, Tournamatic — Trade Mark Reg. U.S. Pat. Off. Color

PRODUCTION TABLE — DIRTMOVING

Haul	Yards in 1 Hour	Yards in 8 Hours
50′	184	1472
100′	118	944
200′	66	528
300′	46	368
400′	35	280

PRODUCTION TABLE — PUSHER LOADING

Haul One-way	Tournapulls served	Haul One-way	Tournapulls served
300′	2	5,000′	7
1,000′	3	6,000′	8
2,000′	4	7,000′	9
3,000′	5	8,000′	10
4,000′	6	10,000′	13

Above production based on good working conditions, negligible grade level cuts, efficient management and 60-minute-per-hour operating efficiency.

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